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APR 79   D R LAVIS, E G BAND, A W FOWLER   DOT-CG-806510-A

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LEVEL II (12)

Report No. CG-D-75-79

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BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY SUPPORTED CRAFT

(VOLUMES I-VI)

TASK 1 REPORT

APRIL 1979

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Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
United States Coast Guard
Office of Research and Development
Washington, D.C. 20590

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16. Abstract

A background study was performed as the first part of an examination of intact stability standards to be applied to United-States-flag, dynamically supported craft. The background study consisted of a bibliographic search, document review, preparation of separate bibliographies for four selected classes of dynamically supported craft, and an annotation and critique of the most significant documents. Few dynamic stability related accidents were found to have occurred among dynamically supported craft to date, but the few that have occurred have provided supporting material for the study. Key documents were reviewed and annotated giving details of model-test programs, stability criteria, full-scale-test series, and analytical studies. It is believed that sufficient material has been found to support the next part of the study, which is to classify the craft according to their susceptibility to the development of similar stability standards.

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METRIC CONVERSION FACTORS

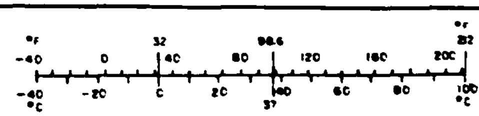
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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1. SUMMARY

A background study was performed as the first part of an examination of intact stability standards to be applied to United-States-flag, dynamically supported craft. The background study consists of a bibliographic search, document review, preparation of separate bibliographies for four selected classes of dynamically supported craft, and an annotation and critique of the most significant documents. Few dynamic stability related accidents were found to have occurred among dynamically supported craft to date, but the few that have occurred have provided supporting material for the study. Key documents were reviewed and annotated giving details of model-test programs, stability criteria, full-scale-test series, and analytical studies. It is believed that sufficient material has been found to support the next part of the study, which is to classify the craft according to their susceptibility to the development of similar stability standards.

2. INTRODUCTION

The Intergovernmental Maritime Consultative Organization (IMCO) recently (14th NOV 77) published its proposed Code of Safety for Dynamically Supported Craft* and the provisions of the code are being studied by the member countries of the Organization. In the United States, the U.S. Coast Guard has been charged with the responsibility for evaluating the proposed safety standards, and, if deemed necessary, for proposing amendments or new safety standards for commercial, dynamically supported craft operating in U.S. waters. Proposed revisions to the IMCO Code of Safety were to be investigated and formulated by the Coast Guard by means of a study to:

> Establish the background of stability of dynamically supported craft by a literature search
>
> Classify dynamically supported craft by susceptibility to like stability standards

If these activities suggest that effective stability standards could be developed for dynamically supported craft, the Coast Guard proposes to complete the study by:

> Determining the effect of parameters critical to intact stability in displacement and non-displacement operation
>
> Developing stability standards for one or more classes of craft

The IMCO Code of Safety for Dynamically Supported Craft applies to craft carrying more than 12 passengers but not more than 450 passengers, all seated, proceeding not more than 100 nautical miles from a place of refuge. The code is further based on the premises that:

(a) the distance covered and the worst sea state for which operations will be permitted will be restricted;

(b) there will, at all times, be reasonable proximity to a place of refuge;

(c) adequate provision will be made for communication so that any accident to the craft will be quickly known to the base port;

(d) facilities are provided for rapid evacuation into suitable survival craft;

(e) rescue services will be rapidly available throughout the voyage;

(f) reliable weather forecast for the area concerned will be available;

(g) acceptable maintenance and inspection facilities, together with adequate control arrangements, are available;

(h) strict control over operations will be enforced;

(i) all passengers are provided with a seat and that no sleeping berths are provided.

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*IMCO Resolution A 373(x) 14 NOV 1977.

The IMCO Code of Safety is written in general terms illustrated by the first two subsections of section 2.5 of the Code entitled "Stability of the Craft in the Non-Displacement Mode":

"2.5.1 The Administration*should be satisfied that, when operating in the non-displacement and transient modes within approved operational limitations, the craft will, after a disturbance causing roll, pitch, heave or any combination thereof, return to the original attitude.

2.5.2 The roll and pitch stability of each craft, in the non-displacement mode, should be determined experimentally, prior to entering commercial service, and be recorded."

The objective of the present study is to develop specific stability standards for U.S. flag craft of one or more classes of dynamically supported craft selected from:

Air-Cushion Vehicles

Surface-Effect Ships

Hydrofoil Craft

Planing Craft

The intention of the stability standards is to provide more detailed national regulations for the improvement of safety of U.S. flag craft, as indicated in Subsection 1.2.3 of the proposed IMCO Safety Code. Based on the comprehensive coverage of the Code, the U.S. stability standards are intended to be specific, as, for example, the present passenger-load-heel and wind-heel stability standards are specific to conventional craft.

The background study resulted in the preparation of five separate bibliographies, one for each class of craft and one for general subjects. One third to one half of the bibliography entries are provided with abstracts and a selected set of the most significant reports in each class are given an annotation and critique.

The report which follows covers the background study consisting of:

Bibliographical Search

Review of Documentation and Preparation of Bibliographies

Annotation and Critique of Selected Documents

Summary and Interpretation of Stability Literature

*"Administration" means the Government of the State whose flag the craft is entitled to fly.

3. BIBLIOGRAPHY SEARCH

A literature search was conducted to obtain abstracts of documentation on the stability of dynamically supported craft. The search included the following tasks:

A preliminary analysis of craft stability

A determination of search specifications

Selection of sources of abstracts

Acquisition of abstracts

Selection of documents for acquisition.

3.1 Preliminary Analysis

The preliminary analysis of craft stability in the dynamically supported and displacement modes provided an initial starting point for the bibliographic search. Four classes of dynamically supported craft were analyzed:

Amphibious Air Cushion Vehicles (ACV)

Rigid-Sidehull Surface-Effect Ships (SES)

Hydrofoil Craft

Planing Craft.

The behavior of each class was outlined with respect to stability in roll, pitch, yaw and heave, including the history of stability related accidents, stability in a seaway and design guidelines to reduce the accident risk. This work is included as Appendix A (BLA 18JAN78).* Some of the more significant findings from the preliminary analysis include:

ACV Stability+ -

- The most significant accidents involving ACV stability have been the following:

April 8th 1965	SRN5-001 capsize in Alesund Harbour
May 11th 1965	SRN5-007 capsize in San Francisco Bay
July 8th 1966	SRN5-005 capsize off Calshot
March 12th 1972	SRN6-012 capsize off Southsea

- All the SRN5 capsizes were in glassy calm sea conditions and were of a plow-in type resulting from a high-speed, high-yaw-angle turn or pirouette.

- Damaged or poorly maintained skirts were claimed to be, in part, responsible for the Alesund Harbour and Calshot accidents while the San Francisco Bay accident was claimed to be the result of gross mishandling of the controls by a driver under instruction.

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*Entries in the bibliography have been made in alphabetical order using an acronym of the Author's company (or affiliation) or Author's last name if his company and affiliation are unknown or are less descriptive of the source.

+Findings derived, for the most part, from CAA June 75.

- The SRN6 accident, off the entrance to Portsmouth Harbour, Southsea, occurred in severe weather conditions, (high winds, gusting to forty-five knots, against a three-knot tide producing short, steep seas with waves estimated to be six to eight feet high and up to sixty feet long). Although 22 people escaped, five people lost their lives.

- Capsizes have occurred in craft which otherwise have behaved satisfactorily. Consideration must, therefore, be given to the danger of capsize in all types of craft; unusual environmental conditions, damage or mishandling may put any craft unexpectedly at risk. Capsizing conditions may occur when the craft is operating on full cushion or operating in the displacement mode or in any condition in between these two extremes.

- Capsizes have occurred over calm water, rough water and overland. In each case the craft was travelling essentially beam-on at some time during the capsize.

- ACVs have exhibited a marked bow-down instability mode (plow-in) when travelling bow leading. This can cause gross directional instability resulting in high-side-slip operation and danger of overturning.

- Generally, the following standard sequence of events has applied for an over-water capsize from the on-cushion condition:

  - Initially, the craft is on-cushion and operating normally.

  - The craft is put in to a bow down or side down attitude due to engine failure, lift power reduction, skirt failure, manouver or wave action which results in the leading skirt tucking-under.

  - The craft losses its directional stability and a substantial side slip angle is developed.

  - Large roll angles occur and the hard structure of the craft makes contact with the water surface.

  - The actual capsize occurs.

- No commercial ACV has so far capsized in pitch (i.e. "pitch-poled") principally due to the shape of the hull which provides a strong righting moment in pitch following hard structure contact with the water.

- Leading skirt tuck-under is the most significant factor in the sequence as a necessary, although not in itself sufficient, condition for capsize.

- Distortion of the skirt system has occurred when the skirt is inflated to less than design pressure following damage, and/or reduced air flow rate.

- The planing forces on all relevant surfaces including the deformed skirts can have an important effect in determining whether the craft will tend to right itself or tend to capsize.

- In the displacement mode the stability assessments for ACVs are essentially the same as those for ships.

- Not very much is currently known about the actual capsizing boundaries of some craft and especially of the margin between the warning onset of skirt tuck-under and the actual point of capsize.

- In 1973 the British CAA and ARB formed a Special Committee to examine all aspects of ACV capsizing with a view to improving the relevant British Hovercraft Safety Requirements (BHSR's). This Committee met over a period of some two years and their report to the ARB was published as CAA Paper 75017, June 1975, from which many of the findings stated above were derived.

- Subsequently, a general research program following the CAA Committee's recommendations was conducted by BHC for the Ship and Marine Technology Requirements Board of the British Government's Department of Industry. The title of the project, which is to be completed by the end of 1979, is "To Determine, Quantitatively, the Design Criteria Which Will Define Hovercraft Capsizing Techniques More Precisely."

Surface-Effect Ship Stability -

- One case of a capsize of a rigid sidewall craft is known, that of the U.S. Navy's XR-1 test craft in December 1964 on the Delaware River.

- The XR-1 rolled outboard in a turn, vented its cushion and rolled over.

- The results of subsequent model tests were used to redesign the XR-1 with modified sidehulls and hull planform of lower length-to-beam ratio.

- Bow-down pitch motions, involving sharp vertical accelerations have been experienced in the SES-100A test craft.

- Bow-down pitch excursions, "pitch-click," * have been observed in the SES-100B.

- After installing large, fixed stabilizers of hydrofoil type near the bow of the 100A, no further excessive pitch excursions have been observed.

- Adverse cushion-pressure gradient (pressure at bow less than at stern) and bow-down moment phenomena are problems affecting stability in some designs of SES.

- Risk of pitch instability is increased as speed is increased, and as values of bow-down pitch attitude are increased.

- Turn radius at a given speed, particularly high speed, must be kept safely above a lower limit at which a danger of roll instability exists.

- Roll instability can be controlled at the design stage through length-to-beam, cushion-height-to-beam and c.g.-height-to-beam ratios and appropriate sidehull shaping and seal design.

- Stability can be improved by providing favorable sidehull-deadrise angles, adequate freeboard, turning skegs to provide favorable righting moments during turns and by installation of hydrodynamic roll stabilizers.

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* Associated with leading skirt tuck-under.

- The most significant contributions to the study of SES stability have resulted from work sponsored by the U.S. Navy's Surface Effect Ship Project Office (PMS 304). Recent reports by Rohr Industries under contract to PMS 304 for the design of the 3KSES have been made available.

- Other significant contributions should be available from Bell Aerospace Corporation as a result of their prior involvement with the U.S. Navy's 3KSES and SES 100B programs. Reference to some of this prior work is identified in the SES bibliography which forms part of this report. Recent activities by Bell Halter to gain a USCG operating license for their B-H 110 demonstration prototype SES and for their other projected designs has resulted in stability analyses which have been submitted to the USCG New Orleans Office. However, we have been informed that this information will not be released for evaluation as part of the work discussed in this present report.

Hydrofoil Craft Stability -

- Accidents involving stability include the FRESH 1 in 1963, in which directional control was lost leading to sideslip and roll over.

- The H 890 French hydrofoil is reported to have met with an accident involving foil ventilation in 1975.

- Stability can be achieved with fully submerged foils up to a significant wave height equal to the foil to keel height, and wave cresting is acceptable up to a limit based on crew comfort.

- Broaching of a fully submerged foil in a seaway may cause loss of lift upon reentry, due to ventilation, and the craft will become hullborne.

- Fully submerged foil craft with airplane configuration are more susceptible than canard arrangements to asymmetric broaching resulting in roll destabilizing moments.

- Broaching appears to be less of a problem in surface-piercing foil systems.

- Turning maneuvers must be limited with respect to speed and rate of turn to avoid foil broaching and loss of roll stability.

- Yaw stability can be lost by after-foil broaching, or by strut ventilation. This can lead to capsize.

- The most significant contributions to the study of hydrofoil-craft stability have been found in work by Boeing Aircraft Corporation sponsored by DTNSRDC and work by Supramar sponsored by the recent U.S. Navy's Advanced Naval Vehicle Concept Evaluation Program.

Planing Craft Stability -

- Porpoising with the combination of heave and pitch instability is potentially dangerous when large excursions develop and the windage on the hull causes the craft to leave the water and capsize. This phenomenon has been observed in racing hydroplanes but not in large craft.
- The bottom of some types of planing craft hulls result in poor roll stability at speed due to the reduction in lateral dimension of the planing area in water contact.
- Capsizes have occurred during turning maneuvers when a deep forefoot trips due to pitch motion or to a wave impact.
- Passenger or crew injury can result from high-speed operation in rough water.
- Most stability related accidents have occurred from a lack of static roll stability and/or swamping at low speed in rough water. However, the most readily available USCG boating accident statistics have been concerned generally with pleasure craft of length less than 20 feet.
- The most significant contributions to the study of Planing Craft stability have been found in work performed by Wyle Laboratories under contract to the USCG and work reported by Vosper Thronycroft, England.

3.2 Search Specifications

Search specifications were developed in general terms from the review of stability problems, and in specific terms for the machine searchable files. General categories of data included:

- Full-scale operations, static
- Full-scale operations, dynamic
- Model tests, static
- Model tests, dynamic
- Analytical studies, static
- Analytical studies, dynamic
- Accident reports
- Stability criteria and requirements
- Environment

The specific requirements developed for the machine searches were expressed in key words used to access the files. The key words formed a two dimensional matrix of types of craft and stability topics:

SET 1	SET 2
Hydrofoil craft	Stability
Planing boat	Pitch
Planing craft	Roll
Captive-air-bubble vessels	Yaw
Air-cushion vehicles	Plow-in
Hovercraft	Porpoise
Ground-effect machines	Broach
Surface-effect ships	Surge
Surface-effect vehicles	Dynamic response
ACV	Dynamic characteristic(s)
SES	Sway
Hydrofoils	Aerodynamic stability
Hydroplanes	Control stability
Cushioncraft	Directional stability
Hydroski	Dynamic stability
Hydroskimmer	Hovering stability
	Lateral stability
	Longitudinal stability
	Motion stability
	Controllability
	Surges
	Dynamic response

3.3 Acquisition of Abstracts

Sources of abstracts in the field of stability of dynamically supported craft included sources for machine-searched abstracts and sources for listed abstracts and document titles. The selection of sources in these categories was accomplished by considering:

- the relevance of their material to the program
- some idea of the quantity of relevant material possessed
- the method and specifications for accessing the data
- overlaps of their data with other sources
- costs
- search capability and techniques
- their recommendations of other data sources on the subject
- experience with previously used sources
- previous source selection and evaluation

One of the most comprehensive sources of machine searchable abstracts is the Lockheed Dialog service, which provides on-line searching of 69 machine-readable files, accessible at our terminal. Consideration of cost and the fairly elaborate procedures needed to set up and operate the system were compared to our previous experience with the North Carolina Science and Technology (NCSTRC) service. A decision was finally made in favor of the North Carolina source.

5.3.3 BOEING AUG 63

NCSTRC provided a rapid response with abstract compilations from:

National Aeronautics and Space Administration file

National Technical Information Service file

Engineering Index (Compendex) file

Print-outs from other machine searches relevant to dynamically supported ships and craft included:

• Ship/Craft Stability	DTNSRDC Advanced Ship Data Bank
• ACV Seakeeping	DTNSRDC Advanced Ship Data Bank
• Stability Documentation	DTNSRDC Advanced Ship Data Bank
• Casualties	DTNSRDC Advanced Ship Data Bank
• Hydrofoils	Defense Documentation Center

Bibliographies on stability and related subjects were obtained as follows:

- Advanced Naval Vehicles Concepts Evaluation Reference List
- ACV Bibliography. Hovering Craft and Hydrofoil
- Accumulated Titles of Maritime Research Information Service
- SNAME Listof Publications, 1964-1977
- DTNSRDC Small Craft Design Guide
- Publication sponsored by U.S. Navy Surface Effects Ship Project Office, PMS 304.
- PMS-304 Technical Library Publications
- NAVSEC High performance Ship Data File
- BLA Library Card File.

Seeking material to supplement the abstracts and document lists, letters were sent to the following 12 U.S. and overseas organizations active in research and development on advanced craft.

- Engineering Societies Library
- NASA, Langley Research Center
- National Physical Laboratory
- Massachusetts Institute of Technology
- NATO, Scientific Affairs Division
- Cranfield Institute of Technology
- British Ship Research Association
- Netherlands Research Center for Shipbuilding and Navigation
- Association Francaise des Ingenieurs et Techniciens de L'Aeronautique et de L'Espace
- University College of Swansea
- University of Southampton
- Chalmers University of Technology

5.3.8 DREA AUG 72

Our inquiry to the National Physical Laboratory was forwarded to the Ship and Marine Technology Requirements Board of the Department of Industry who have promised to send us, for use in this study, a copy of the report of an ongoing project entitled, "To determine quantitatively the design criteria which will define hovercraft capsizing techniques more precisely". The project is being carried out by British Hovercraft Corporation. The results should be of much help in the study of hovercraft stability.

3.4 Abstract Review and Acquisition List

The abstract lists and document lists were reviewed to obtain a manageable list of the most significant documents for acquisition, review, classification and annotation.

4. DOCUMENT REVIEW AND DATA CATEGORIZATION

The abstracts and document titles selected for the study were organized into five bibliographies:

- A Bibliography of Amphibious, Air-Cushion Vehicle (ACV) Stability Related Reports.
- A Bibliography of Rigid-Sidehull, Surface-Effect Ship (SES), Stability Related Reports.
- A Bibliography of Hydrofoil Craft Stability Related Reports.
- A Bibliography of Planing Craft Stability Related Reports.
- A General Bibliography of Ship and Small Craft Stability Related Reports.

In each bibliography, material selected for acquisition, material actually obtained, and material annotated are distinguished by appropriate marking. The bibliographies were prepared by:

- Selection of library from which to obtain each document
- Document acquisition
- Document review
- Selection of significant and relevant articles
- Categorization of data
- Preparation of bibliography

5.4 Planing Craft Literature Annotation and Critique

4.1 Document Sources and Acquisition

Documentation for the study has been obtained form:

1. The National Technical Information Service (NTIS)
2. The Royal Institution of Naval Architects (RINA)
3. Society of Naval Architects & Marine Engineers (SNAME)
4. North Carolina Science & Technology Research Center
5. U.S. Naval Academy Library
6. David W. Taylor Naval Ship Research & Development Center (DTNSRDC)
7. American Institute of Aeronautics & Astronautics (AIAA)
8. American Society of Mechanical Engineers (ASME)

In addition, a number of documents were obtained on loan from the DOT library.

4.2 Document Review and Organization

Literature acquired for the study was sorted by class of craft, and by one general category. The documentation was reviewed to establish its value to the Phase I study, and in particular its value under the nine categories of required data. (As identified on page 8).

Three levels of usefulness were defined:

- A First-class material
- B Supporting material
- C Useful but non-essential to study.

An evaluation table was prepared for each class listing the documents reviewed and the level of usefulness in each of the nine data categories. These tables have been incorporated into the craft class bibliographies.

4.3 Preparation of Bibliographies

The five bibliographies include the documents selected as relevant to the study, documents acquired and reviewed for specific relevance to different types of required data, and documents reviewed for annotation.

Each item in the bibliography is identified by a code name and date. The code name is a reference to the source organization (i.e. DTNSRDC) of the document, and usually an abbreviation is used. References cited in the text use the identical code name and date. The source organization and date provide the reader with useful information while identifying where to find the full reference in the bibliography. Source organization was felt to provide more information to the average reader than author's name, who might be known only to a few.

The bibliographies are arranged alphabetically, and reference numbers are avoided. Each letter of the alphabet begins on a fresh page to facilitate the insertion of new entries to the bibliographies in case updating is required at a later date.

5. ANNOTATION AND CRITIQUE

Annotation of the principal documents found in the bibliographic search was prepared to augment the abstracts, and to show the usefulness of the documents selected to the craft classification study and also to the preparation of intact stability standards. The documents selected for review included all of those selected as first-class material.

5.1 ACV Literature Annotation and Critique

5.1.1 CAA JUNE 75

"Report of the ARB Special Committee on Hovercraft Stability and Control", Civil Aviation Authority CAA Paper 75017, ASDB 10-U06986M, June 1975.

This report summarizes the information on hovercraft capsizing available to the U.K. Air Registration Board Special Committee on Hovercraft Stability and Control. A list of all known overwater commercial-sized craft capsizes along with all known overland capsizes of recreational-sized hovercraft is given. Where known a brief discussion of the capsizing and the events leading to the capsizing for particular craft are included. Also included, where known, is a list of craft particulars (geometric parameters) of the craft involved. From this investigation of capsizing events and craft particulars some of the factors affecting capsizing, with particular reference to geometric parameters, are brought out and recommendations are made on a range of suitable values of design parameters considered most critical to minimize the risk of capsizing.

Results of model tests of the HD-2 research craft (chosen as a representative example) are analyzed and recommendations for further research are listed.

The Committee reviewed the factors which could affect capsizing, but did not feel justified in attempting to put recommended values for all the factors. It was considered that a basic research program was necessary in order to establish suitable combinations of the numerical values required.

Despite this, an attempt at analyzing the capsizing sequence was made, and in order to simplify the analysis, the following sequence was assumed to occur in each over-water capsize from the on-cushion position -

i) Initially the craft is on-cushion and operating normally.

ii) A situation and/or a maneuver occurs which causes leading skirt tuck-under.

iii) The hard structure of the craft makes contact with the water surface.

iv) The actual capsize occurs.

5.4.3 WYLE MAR 74

Leading skirt tuck-under was found to be the most significant factor in the sequence as a necessary,although not-in-itself sufficient,condition for this form of capsize. Probably the most important single feature leading to skirt tuck-under and possible capsize when travelling beam-on is reduction of the lift-engine power.

Some analysis of skirt tuck-under, as mentioned already for the HD2 is contained in the report. In this respect the Committee was able to draw upon the results of an analysis on hovercraft safety, being carried out by BHC under contract to the Department of Trade and Industry.

Various conclusions and recommendations are made in the report on the design, model and full scale testing and operational aspects to minimize the risk of capsizing.

The Committee recognized that many problem areas had been highlighted and therefore further general research was recommended, not only to increase basic data and knowledge, but also to enable better theoretical techniques to be formulated.

As a result of this work, a general research program based on the Committee's recommendations was formulated by the CAA, BHC and others in the hovercraft industry. This was put to the Ship and Marine Technology Requirements Board and research funding was made available to BHC. This new work by BHC is now near completion and results are expected to be made available to the USCG in early 1980.

5.1.2 WHEELER MAY 71

"Control of Single-Propeller Hovercraft with Particular Reference to BH-7", by R.L. Wheeler, Canadian Aeronautics and Space Journal, May 1971, pp. 189-206.

During the development of the BH-7 an extensive series of model tests were carried out. Among the objectives were the evaluation of stability-control devices and various skirt configurations.

The stability-control devices investigated were a skirt-lift device, skirt-shift device and cushion-feed valves. The model tests showed all three schemes to be effective means of stability control. Due to design and powering constraints the skirt-lift device was selected.

The first skirt fitted to the model was a 5-1/2 ft.-deep,50% fingered skirt with a single rear skirt employing conical nozzles, twin stability bags and a jetted keel. After testing this system the model was fitted with a totally new skirt. The new skirt consisted of a continuous peripheral bag with antivibration diaphragms and a centipede type keel. The idea behind the continuous peripheral bag was to remove the leakage path between the side skirt and stern skirt. Due to poor bag-pressure distributions the antivibration diaphragms were replaced with longitudinal antivibration webs. During the first 20 seconds of testing this configuration the model overturned due to leading-skirt tuck under. The final solution to the tuck-under problem was to raise the outer hingeline of the skirts by approximately 3 feet. This modification, when combined with the longitudinal antivibration webs gave very good resistance to tuck under, freedom from vibration and a better pressure distribution around the skirts.

The report provides valuable model data showing the results of testing with various applied-roll destabilizing moments with beam-on motion in a towing tank. These results were compared, in the report, with the results of free-flight tests during which the limits of model overturning were established. The combined results of constant-speed static-stability tank tests and free flight model tests were shown to represent a very significant approach to determining acceptable craft geometry. Further data of this type is being sought for input to task 2 of phase I and for the conduct of phase II.

5.1.3 BHC MAR 73

"Model Tests to Investigate the Safety of the HD2, ACV in the Yawed Condition", by B.G. Clarke, British Hovercraft Corporation Report No. X/0/1682, March 1973.

The report describes tests, conducted for the British Government's Department of Trade and Industry, using a 1/4-scale dynamic model of the HD2. Results are presented showing roll stiffness over calm water with the model travelling beam-on (sideways) at the critical, beam-on, hump speed and one higher speed. The behaviour of the model when travelling beam-on in steep beam (following) seas was also investigated.

The model was found to be relatively soft in roll and the skirts deformed fairly readily as expected with an uncompartmented cushion and skirt-loop pressures equal to cushion pressure. The constant-speed tests demonstrated that there was a very narrow band of speed over which the craft was unstable in roll and could be forced into a potential overturning condition with the application of only moderate adverse moments. During tests in beam seas the model never appeared likely to overturn.

The combination of an effective planing structure and trailing side-skirt segment scooping, together with a relatively high value of cushion-beam-to-skirt-depth ratio (i.e. 7.5) appeared to provide a reasonably safe overall craft.

The type of tests conducted and the presentation of results will provide an invaluable input to task 2 of the present program.

5.1.4 ANON SEPT 65

"Overturning: Causal Factors and Curative Measures", Air Cushion Vehicles (Suppl. to Flight), Vol. 6, Sept. 1965, pp. 32-33, 40-42.

The two overturnings of Westland SRN-5's led that company into an extensive research program to discover their causes and make the necessary modifications in order to avoid, as well as possible, any future occurrences. The two overturnings, caused by plow-ins and, finally, hard-structure dig-in during turning maneuvers, were found to have different underlying reasons for their occurrence. The first overturning occurred when the vehicle, piloted by an experienced ACV pilot, was put into a violent right turn. During the maneuver a prototype longitudinal stability keel completely failed resulting in the lack of roll-stabilizing-force generation. It was concluded that, due to his experience, the pilot

would have been aware of the failure if it had happened prior to the maneuver. The stability keel was subsequently modified by incorporating rip-stops in order to avoid the total failure of the system. The second overturning was found to have been caused by an inexperienced pilot placing the craft in a grossly uncoordinated turn during acceleration, which resulted in a violent plow-in. This led to Westland Company into an intensive model and full-scale research program to determine what types of skirt modification (other than the vertical drag reducing strakes already present) were necessary in order to make the craft less susceptible to violent plow-in during mismanagement of the craft controls. The model studies indicated that the addition of two rows of air bleed nozzles in the skirt, to air lubricate the skirt when it is in contact with the water as in plow-in, reduced the drag which is the major producer of destabilizing forces. Subsequently an SRN-6 was modified to include the air-bleed nozzles and a series of full-scale tests was started. The full-scale tests involved running the craft at speed in a straight course and applying adverse control forces in order to plow the craft in. The application of adverse control forces was also performed with the skirt modified to include the air-bleed nozzles. Full adverse application of controls with the craft running straight at 63 knots produced a smooth plow-in that was considered to be absolutely safe, whereas the plow-in of the unmodified skirt at 55 knots was considered completely unacceptable. The plow-in for the unmodified skirt during the turning maneuver occurred at 30 knots and required immediate corrective action. For the modified skirt a plow-in at 45 knots during the turning maneuver required corrective action but the adverse controls could be held for 4-5 seconds before any recovery action had to be taken.

At the time of the SRN-5 accidents the craft were fitted with the "early" jetted-bag peripheral skirt. Subsequent development of the bag-finger skirt avoided the need for the vertical strakes and air-bleed holes mentioned above. Careful selection of skirt attachment points, inflated geometry, pressures and the use of the so-called "anti-plow-in diaphragms" (although not necessarily employed to prevent plow-in) has lessened the severity of plow-ins which have subsequently occurred.

5.1.5 ANON MAY 65

"Overturning. Some Causative Factors", Air Cushion Vehicles (Suppl. to Flight), Vol. 6, May 1965, pp. 64-72.

With the overturning of two SRN-5 hovercraft some discussion of hovercraft stability, with particular attention to roll stability, is made. The question of why the N5 is the only craft known to have overturned is answered in part by the fact that due to its useful size and performance it has been produced in large numbers and has logged a greater number of cushionborne hours than any other craft at the time of the accidents. Particular features of the SRN-5 that might make it prone to trouble are that the N5 had (at the time of the incidents) the greatest hover height in relation to its width of any other hovercraft. The generation of roll-restoring forces is briefly discussed and attention is drawn to the fact that as hover height is increased for a given width, the generation of roll-restoring forces (stabilizing forces) becomes increasingly harder. The mechanism of drag-induced rolling forces is also discussed along with the means and/or lack of means for stabilizing force generation. Recommendations for side-structure shaping (with particular reference to the SRN-5) are made to avoid the possibility of side-structure dig-in and potential overturning due to high roll angles caused by drag-induced roll.

5.1.6 ANON OCT 65

"The Overturning Report: Some Comments", Air Cushion Vehicles (Suppl. to Flight), Vol. 6, 20 Oct. 1965, p. 47.

Some comments pertaining to the report released by the Westland Company on the overturning of two SRN-5 craft are made. It is felt that, although there has been a speed limit/yaw angle restriction placed on the SRN-5, certain emergency situations could arise where these limits are exceeded and proper corrective action not made. It is pointed out that the hydrodynamic forces on the skirt during plow-in are not great enough to cause the final roll over of the craft. In both cases the hard structure contacted a bow wave with the craft at 60° to 70° angle of yaw. The hard structure, in the region of contact, is shaped in such a manner as to promote dig-in. Recommendations are made for reshaping the hard structure in the region of water contact in such a manner as to promote the generation of hydrodynamic roll restoring forces. A discussion of future craft needs is made due to their high anticipated speeds and larger size. Proposed answers to these craft needs are things such as automatic center-of-pressure shift devices, multiple fan-lift systems, hull shaping and near-vertical skirt arrangements that give reduced contact area and thus reduced drag when in contact with the water as in a plow-in.

5.1.7 BAT JAN 66

"Roll Stability Evaluation of the U.S. Navy Patrol Air Cushion Vehicle (PACV) SK-5", Bell Aerosystems Co., Rept. 7500-0027007, BUSHIPS Contract NObs 4917, Jan. 1966.

A stability evaluation has been made of the U.S. Navy patrol air-cushion vehicle (PACV) in the Bell Aerosystems SK-5 model 7232 configuration. In the report, written specifically for PACV operational personnel, consideration is given to the full envelope of operating conditions anticipated for this craft. Plow-in is defined and the large hydrodynamic drags and skirt distortions associated with plow-in are discussed. Attention is drawn to the fact that under certain critical conditions plow-in can result in an overturn. From model and full-scale data it is concluded that the only operating conditions of model 7232 that will significantly influence the initiation of a plow-in are high gross weight and high c.g. position. Recommendations are made for forward c.g. limits as a function of vertical c.g. position and craft gross weight.

The dominant factor in avoiding a plow-in is proper control management by the pilot with the single most important factor being proper coordination between throttle and propeller-pitch controls. Recommendations for control management are made in order to avoid plow-in, particularly during a turn.

5.1.8 BAT AUG 66

"Air Cushion Vehicle Roll Instability Investigation", Bell Aerosystems Report No. 7500-927013, BUSHIPS Contract NObs 4917, Aug. 1966.

The roll-stability investigation carried out provided a good understanding of the various factors associated with air-cushion vehicle plow-in and overturning. Conditions under which plow-in and overturning can occur were established. Safe operating limits, with particular reference to SK-5 and SKMR-1 craft, along with correct operating procedures which eliminate any danger of overturn have been defined. Recommendation for certain design improvements which reduce the tendency of overturn are outlined.

Dynamic scale models of SK-5, SKMR-1 and SK-5 with a modified hull were tested in towing tank facilities and a mathematical analog computer model was analyzed in the study program. Main conclusions drawn from the study are:

- Plow-in can occur on any skirted ACV if any appreciable skirt drag occurs when the leading portions of the skirt are caused to contact the water.
- Plow-in can be safely tolerated for a range of speeds at near-zero sideslip, or beam on at relatively low speeds. The combination of high speeds and sideslip should be avoided since plow-in or loss of lift under these conditions could produce an overturn.
- The operator can eliminate the possibility of overturn by employing proper operating procedure; that is by slowing down prior to attempting a tight turn and maintaining a safe speed during the turn, thus the critical high-speed high-sideslip region is avoided.
- SKMR-1 and SK-5 were both safe when operated with reasonable caution and within their respective operating envelopes which are both outlined in the report.
- The safe operating envelope of the SK-5 can be extended by modifying the hull to a more favorable hydrodynamic shape thus eliminating the possibility of hard structure dig-in.

5.1.9 DTNSRDC FEB 79

"The AALC Cushionborne Stability Technology Baton", by Alvin Gersten, DTNSRDC Report SPD-0862-04, February 1979. Preliminary draft; final document to be published by NAVSEA.

The Cushionborne Stability Technology Baton is a summary of all documented on-cushion-stability-related technology that has been developed or used in support of the U.S. Navy's Amphibious Assault Landing Craft, AALC JEFF(A) and JEFF(B). It represents the state-of-the-art as reported in available documentation as of early 1978. Included is the stability prediction and evaluation technology for both static and dynamic stability. The report summarizes in detail,the analytical methods used to predict and then evaluate the stability of the Jeff craft during their development.

The section on model tests discusses the various configurations tested and also the different types of tests that were conducted. A summary of the results of these tests is included. The plans for the full scale test and trials are also briefly discussed. These full scale tests are expected to prove in part the technology used to develop the Jeff craft and if necessary they will be used to modify any technology area that seems to be in error.

Not read due to unavailability. It is understood however, that a method is introduced for the statistical determination of the rolling behavior of a ship

5.2 Rigid Sidehull Surface Effect Ship (SES) Literature Annotation and Critique

5.2.1 ROHR AUG 78

"Stability and Maneuvering Report", by E.H. Price, R.C. Stoner and N.L. Wener, Rohr Marine Inc. for U.S. Navy SES Program Office (PMS304) 3KSES Program Report No. TTP00013A, CDRL No. E03L, 31 August 1978.

This is the second and latest in a series of reports which describe the on-cushion and off-cushion stability criteria which is being developed for the U.S. Navy's 3KSES. A wealth of experimental and analytical data is presented to describe the static and dynamic behaviour of the 3KSES. Considerable data is presented on combined modes of motion. A rather conventional approach is used for the assessment of hull-borne stability. Although off-cushion pitch roll and directional stability is treated form both a static and dynamic point of view, no consideration is given to extreme angular motions and limits of stability as is the case for more conventional ships.

For on-cushion operation stability envelopes are specified for acceptable angular excursions which result from normal maneuvering operations or from selected ship system malfunctions. These envelopes are established at angular excursion levels which are 75% of values explored during 3KSES model tow-tank tests. It is emphasized that these limits of stability do not in any way imply that instability lies just outside the established envelopes. Knowledge of such conditions is, unfortunately, not available, so it is claimed that it is sufficient only to demonstrate that the motion of the ship under critical conditions will remain well within those attitudes which have been shown to be safe from model experimentation.

The report also includes the results of ship maneuvering and stability trade-off studies in which the degree of pilot intervention in controlling craft motion is assessed as a significant variable. The response of the ship to system failures is also assessed along with the associated probability of single and multiple failure events.

5.2.2 DTNSRDC MAY 67

"Captured Air Bubble Vehicle Stability Tests", by Robert A. Wilson, DTNSRDC, AIAA/SNAME Paper No. 67/349, 22 May, 1967.

Results of calm water, steady state turn stability tests on numerous Captured Air Bubble (CAB) vehicle design configurations are presented. The relatively high speed experienced by the CAB vehicle with its high center of gravity present stability problems whose solutions are intrinsically enmeshed with the nature of the craft itself. Strong interactions between sideslip (yaw), roll, heave, pitch and bubble pressure increase the complexity of the problem. A test technique was devised where, by virtue of the Froude scale laws, models are analogs of larger vehicles in turns with equal centripetal accelerations. In this test technique used, side-slip angle is taken to be the prime independent variable, being closely related to the centripetal force (or acceleration) on the craft in a turn. Roll, pitch, heave and bubble pressure are dependent variables.

The goal has been to find configurations that exhibit yaw and roll static stability in relatively severe smooth water turn conditions. Primary configuration variables are beam dimension, sidewall shape, forward and aft seal design, centerboard and ventral stability fins of various designs. Quantitative results are presented which identify design directions that provide significant progress toward the goal of a stable craft.(Author)

It is understood that this investigation was conducted principally as a result of the XR-1 capsize of December 1964 and is believed to represent the only comprehensive hullform parametric series of tests in which an SES model was tested at extreme angles of roll and sideslide.

5.2.3 DTNSRDC JULY 68

"Stability Test of Bell Aerosystems SES Model B-12 in Calm Water", by H.D. Holling, DTNSRDC, ASDB 10-U03414L, July 1968.

This report is on early tests of the SES 100B. It has not been obtained for review but is believed to contain significant stability data. An "A" classification may, however, not be justified.

5.2.4 DTNSRDC SEPT 68

"Systematic Variations of Design Parameters Affecting Turn Stability of Captured Air Bubble (CAB) Vehicles and Their Experimental Evaluation", by R.A. Wilson, DTNSRDC, ASDB 10-U04908LM, Sept. 1968.

This report is known to contain information of value to the program but was not obtained in time for review. It is believed to contain the detail background and analysis of the tests described in R.A. Wilson's AIAA Paper, DTNSRDC, May 1967.

5.2.5 DTNSRDC MAR 69

"Design Parameters Affecting Turn Stability of Captured Air Bubble Vehicles", by R.A. Wilson, DTNSRDC, RPT-2965, ASDB, 10-U03968LF, March 1969.

This report is known to contain results of calm water tests for the evaluation of SES turning stability involving variation in model configuration. Although not obtained in time for review it is considered important to the program.

5.2.6 DTNSRDC SEPT 69

"Data Report for an Aerodynamic Force Study on Variable Length to Beam Ratio CAB Surface Effect Ships (Phase II-III) by F. Wilson, DTNSRDC, ASDB 10-U09415L, TN-AL-136, Sept. 1969.

This is a data report which presents aerodynamic force and stability characteristics of high length to beam craft and information on tests of different pilot house configurations. The report should be obtained for further review.

5.3 Hydrofoil Craft Literature Annotation and Critique

5.3.1 BOEING MAR 77

"Hydrofoil Ship Control and Dynamics Specifications and Criteria", by D.R. Stark, W.E. Farris, A.O. Harang, for Boeing Co, March 1977.

"Hydrofoil Ship Control and Dynamics Specifications and Criteria-Technical Substantiation", by D.R. Stark, W.E. Farris and A.O. Harang, for Boeing Co., March 1977.

This two volume study represents a distillation of the Boeing Company's 20 years of experience in the design and testing of hydrofoils. The format is a proposed U.S. Navy specification of stability and control features of submerged-hydrofoil ships as well as the analysis and test procedures to be applied for verification of compliance.

The specifications presuppose the establishment of a design maximum sea state and place a good deal of emphasis on ride quality. The adequacy of control authority is addressed, however, and criteria therefore set forth. Avoidance of cavitation on foils and flaps is emphasized.

Since the foilborne stability of a submerged-hydrofoil ship depends on both mechanical and electrical components of the automatic control system, as well as on the geometry and structure of the strut/foil system, the analysis of control system failure is discussed in depth. The importance of control system reliability is emphasized and means for its assurance are discussed.

This study is still in preliminary form and subject to review by the Navy and other navy contractors. In its final form it should provide the most authoritative base for the development of U.S.C.G. stability standards.

5.3.2 SUPRAMAR DEC 76

"Study of Surface Piercing and Other Hydrofoil Systems, with Appendix (Drawings)", Supramar, Ltd, Switzerland, ASDB 10-U08808M, December 1976.

A comprehensive description of the development of the Supramar series of hydrofoil ships, until recently exclusively of surface piercing foil type. The primary point of interest, therefore, is the insight provided to the design of such ships.

The influence of stability requirements on the principal features of foil design is discussed. Empirical rules are given to assure adequate initial transverse-stability. The range of stability is not considered nor are criteria given for maximum righting moments.

A point is made of the seakeeping ability of the surface piercing foil system whereby, at reduced speed, additional foil area is immersed and damping is enhanced. However, the foil tip becomes immersed at a smaller heel angle and the foil span-loading is reduced by the speed reduction and it is not clear that maximum transverse righting moment is improved.

5.3.3 BOEING AUG 63

"Investigative Board Report on Fresh 1 Accident, July 19, 1963", Boeing Co., ASDB 10-C-0204.

A comprehensive discussion of hydrodynamics and control problems in turning maneuvers of submerged-hydrofoil craft. The findings have been incorporated into present day design doctrine as exhibited in BOEING MAR 77, for example.

5.3.4 BOEING DEC 72

"PHM Foilborne Motions, Maneuverability and Rough Water Behavior Analysis", by A.O. Harang, Boeing Co., ASDB 10-U01109LF, Dec. 1972.

The report should be read. It is expected to be useful as a description of Boeing's analytical procedures and philosophy.

5.3.5 BOEING JAN 68

"Prediction of the Seakeeping Characteristics of Hydrofoil Ships", by I.A. Hirsch, Boeing Co., ASDB 10-U00387M, Jan. 1968.

Document should be read. "A" classification may not be justified.

5.3.6 BOEING MAR 71

"Preliminary Study of Directional Stability as Affected by Tail Strut Ventilation and Tail Foil Dihedral-AGEH-1", Boeing Co., ASDB 10-U02152M, March 1971.

The report should be read. It is expected to disclose Boeing's rationale for directional stability specs. as set forth in BOEING MAR 77.

5.3.7 DREA APR 72

"HMCS Bras D'Or Sea Trials and Future Prospects", by M.C. Eames, M. Eng, T.G. Drummond, DREA RPT 71/9, (AD765050), ASDB 10-U01236LM, April 1972, Defence Research Establishment, Atlantic. Remarks: Paper presented to Royal Institute of Naval Architects on 13 April 1972.

The report presents the results of sea trials of HMCS BRAS D'OR, a 200 ton open-ocean hydrofoil ship, with particular emphasis on behaviour in rough water. These trials have demonstrated the ability of a 200 ton hydrofoil to maintain high speed at least through sea state 5, and to operate hullborne with the seakeeping qualities of a destroyer-escort, thus validating the basic concept. Many practical design lessons have been learned from the trials, and the paper attempts to integrate these by outlining preliminary studies towards the design of a possible succeeding class of naval hydrofoil ships. (Author)

A discusser proposes that the adequacy of transverse stability be assessed by calculating the heeling and righting moments acting when the ship is poised on a beam wave with accompanying beam wind. A similar criterion is proposed in BOEING MAR 77 for submerged-hydrofoil ships.

5.3.8 DREA AUG 72

"Hydrodynamics and Simulation in the Canadian Hydrofoil Program", by R. Schmitke, A. Jones, Defence Research Establishment, Atlantic, RPT 73/3, ASDB 10-U0484M, March 1973. Presented at 9th Symposium on Naval Hydrodynamics, Paris, August 1972.

The design of the surface-piercing foil system is discussed with primary reference to motions in head and following seas. The extremely good seakeeping when hullborne is emphasized.

This ship incorporates automatically controlled anhedral foil tips for enhanced roll control. Maximum transverse righting moment when foilborne should be exceptionally high but values are not given nor is the criterion employed for determining the design of the anhedral tips.

5.3.9 DREA SEPT 72

"HMCS Bras D'Or (FHE-400) Scientific Trials", by T.G. Drummond, R.T. Schmitke, Defence Research Establishment, Atlantic, ASDB 10-C01147L, Sept. 1972.

A discussion of sea trial results with some suggestions for design changes to improve ride quality in head seas. The response to a control system failure indicated a high degree of inherent roll stability.

5.3.10 DREA MAR 71

"A Computer Simulation of the Performance and Dynamics HCMS Bras D'Or (FHE-400)", by R.T. Schmitke, Canadian Aeronautics and Space Journal, V. 17 N3, March 1971, pp. 95-105. Remarks: Preliminary to DREA AUG 72.

A computer simulation is described of the performance and dynamics of the surface-piercing hydrofoil ship HMCS Brad D'Or (FHE-400). Comparison of simulated ship performance with data from calm water trials shows encouraging agreement.

5.3.11 DAC NOV 68

"FHE-400 Phase VI Stability Study", Dehavilland Aircraft of Canada, Ltd., ASDB 10-C00172M, Nov. 1968.

A simulation study prior to sea trials points up precautions to be observed during turning maneuvers. The potential problems apparently were not encountered at sea.

5.3.12 BAKER APR 52

"Selection of Control Parameters in Angle Stabilized Hydrofoil Systems", by J.G. Baker, ASDB 10-C00142F, Baker Manufacturing Co., R-185, April 1952.

Document should be read. "A" classification may not be justified.

5.4 Planing Craft Literature Annotation and Critique

5.4.1 MARTIN MAR 78

"Theoretical Determination of Porpoising Instability of High Speed Planing Craft", Milton Martin, DTNSRDC, published in Journal of Ship Research, Vol. 22, No. 1, March 1978.

This report presents analysis leading to a theoretical method for predicting porpoising in surge, pitch and heave degrees of freedom for prismatic hulls of arbitrary deadrise. The method showed "reasonably good" agreement with porpoising boundaries determined for towed models free to move in the pitch and heave degrees of freedom, but to the date of publication, no model test results were available for all three degrees of freedom. The theory could not be checked entirely for this reason, but the small magnitude of the coefficients on the surge equation compared to the pitch and heave equations suggested that the surge effect would be small.

Oscillation natural frequencies and damping characteristics of the hull can be estimated from the stability roots obtained from the characteristic equation.

This method of predicting the porpoising boundary is claimed by the author to be suitable as a guide for estimating the porpoising limits and dynamic characteristics of more conventional hull forms, and it should be of help in predicting the effects of changes in several of the parameters. With an extension of the analytical methods used, a tool could be prepared for predicting the porpoising boundary as a function of detailed design modifications.

The author illustrates the comparison between results of model tests by Day and Haag (WEBB MAY 1952), and Figure 5-1 is an example showing theoretical predictions of critical trim angle τ_c against speed coefficient C_V $(=V/(gb)^{0.5})$ for a prismatic hull of 10.6° deadrise with three different load coefficients C_Δ $(= \Delta/\rho g b^3)$. Other comparisons are made between the predicted and measured critical trim angle at porpoising as a function of load speed coefficient and non-dimensional radius of gyration. Critical longitudinal center of gravity to beam ratio and critical mean wetted length to beam ratio are plotted against velocity coefficient and compared to experimental results. Comp risons are also given between theory and measured results form non-prismatic model tests including those of Clement and Blount (CLEMENT 1963), and of Davidson and Suarez (DTNSRDC 1949).

Porpoising has been known to cause serious accidents with small high speed planing craft. Although no record of a serious accident with a large commercially operated planing craft due to porpoising was found during the background study, the parameters involved in porpoising instability and porpoising accidents are not a function of craft size. The report provides an opportunity for checking the likelihood of porpoising of new designs of craft, and shows critical relative values of several of the controlling parameters which can be manipulated to prevent the phenomenon. The report should be of high value during safety standards formulation.

5.4.2 VOSPER MAR 78

"An Experimental Investigation on the Roll Stability of a Semi-Displacement Craft at Forward Speed", by K.R. Suhrbier, published as Paper No. 9 of the Symposium on Small Fast Warships and Security Vessels, RINA, London, March 1978.

The report is concerned with a high speed round bilged craft that is partly dynamically supported at speed. Objectives of the series of model tests were:

- To investigate the loss of initial roll stability at speed, using tank tests.
- To study the loss of roll stability in a free running model.
- To examine the performance of spray strakes.

Roll instability has been observed on round bilge and chine hulls when operated at speed. Roll periods tend to increase, and the craft may have a tendency to maintain a roll displacement to one side with accompanying yawing moments that make the craft increasingly difficult to steer as speed increases. At further increases in speed the craft can roll suddenly to one side, followed by a violent yaw beyond the control of the helm. This is a typical "broach" in the sense of that word in planing and displacement craft terminology.

Roll stabilizing moments can be generated by the shape of the hull above the undisturbed waterline. Spray sheets may be used to provide stabilizing moments if they are deflected by the hull shape or spray strakes positioned and shaped so that the differential loads acting on the rails are some function of roll angle.

The tank tests were conducted by towing the model at different speeds and measuring roll angle. The model was fitted out with moveable weights which allowed $\overline{GM}$ to be varied, and models with and without spray rails were tested. The reduction in roll stability was defined as the loss in $\overline{GM}$ compared to the static $\overline{GM}$ as set up by adjustment of the moveable weights before the test run. Model speed at which a roll was just beginning could be plotted against loss of $\overline{GM}$, and the resulting curve showed that over the range of speeds tested, a 25% change in speed produced over a 50% change in the loss of $\overline{GM}$. A marked improvement was obtained with one of the designs of spray strake fitted.

The free running model had to be observed visually, but the evidence of roll instability was quite unmistakable when produced at different speed and $\overline{GM}$ combinations. Again a considerable improvement was obtained with spray strakes.

The report covers stability of a craft on the boundary line for inclusion in the category of dynamically supported craft, and shows the effect on roll stability of rounding the hull to be somewhat similar to the effect of deepening the vee of a hull. Spray strakes are investigated and their improvement shown in one case. A more rigorous treatment of topside spray strakes showing the effect on stability of height, length, slope, cross section would be needed to form a background for assessing their impact on the safety of any design.

5.4.3 WYLE MAR 74

"Standards Analysis - Powering/Performance Evaluation Using Test Course Methods, Volumes 1 and 2."

This report is very significant to the background study, because, although the boats tested were small, the principle of a safety standard based on performance rather than design is fundamental in the reported test program. The results of five separate test programs are presented in which the BIA/ABYC Test Course Method was used to determine the safe power for the total of 96 boats tested. The report infers that the Test Course Method is preferable to the Formula method for calculating maximum safe power based on transom width, boat length, transom height, type of hull and type of steering. Test observations included:

- Hull manufacturer, model and year;
- Hull dimensions, weight, manufacturers rated horsepower and formula horsepower;
- Test weight including hull, engine, driver and gear;
- Test engine manufacturer and horsepower, propeller size, and trim condition;
- Maximum speed;
- Dimensions of test courses used;
- Rated comments by driver and observers, subjective performance ratings, instability detector instrument readings, and pass/fail results.

In one of the test programs, this data was supplemented by time recordings of roll, pitch, yaw, lateral acceleration and motor turn angle.

The report provides useful data on the behaviour of test craft of several different hull forms while undergoing high speed turn maneuvers. Craft were said to "fail" the test course when the behaviour was judged to be unacceptable by the operator and observers. Failure related to hull shape was described:

- V type hulls allowed large roll angles during maneuvers, and "failed" when the combination of speed and maneuver severity caused large roll oscillations.
- Tri-hull boats were "failed" when they exhibited skipping and grabbing tendencies under high speed maneuver.
- Flat bottomed hulls tended to give high side slip velocities during maneuver at speed, and were very sensitive to tripping and capsize.

Unfortunately the results are generally subjective in nature. Further development of instrumentation packages and test procedures may produce an objective measurement of craft behaviour if research is continued in this area. One such approach was used in the tests, this being the use of an instrument to measure and integrate roll oscillations. The relationship between integrated roll oscillation and dangerous roll behaviour was not specified.

5.4.4 WITTER DEC 67

"Rescue Boat Development", by Cdr. Robert W. Witter, USCG, published in Naval Engineer's Journal, December 1967, p. 937.

This paper is significant because it is concerned with the development and behaviour of high speed planing craft designed for rough water operations. The design of an afterbody to reduce the tendency to broach is illustrated, and this hull incorporates a forebody designed to reduce the effect of pounding. As a rescue craft, self righting capability was mandatory.

The craft was developed through successive model stages to a full scale test craft, and its predicted behaviour was confirmed. Some difficulty was experienced with steering until this problem was solved by the use of twin rudders.

The hull incorporates a deep vee shape forward to reduce motion when the craft operates at high speed in a seaway, and has a step approximately at midships to reduce drag. The afterbody is narrowed to decrease the lift while near a wave crest, and the effect of this is to decrease the slamming effect at the bow. Further reduction in the vertical motion is claimed through the use of hydrofoils aft. This aft hull shape is primarily designed to reduce the broaching tendency in following seas.

5.5 General Stability Literature Annotation and Critique

5.5.1 NICKUM JULY 78

"An Evaluation of Intact Stability Criteria" by G.C. Nickum, Nickum and Spaulding Associates, Inc., Seattle, Washington. Published in Marine Technology, Col. 15, No. 3, July 1978.

This report presents a history of the development of intact stability criteria, and describes the existing stability criteria for vessels under 100m (328 ft), including vessels with special functions which could cause large roll angles such as fishing and towing vessels. Although the paper does not discuss dynamically supported craft, the paper provides a clear overview of the reasons why each stage in the development of the existing standards occurred, who first put forward the series of standards, and a summary of the attitudes of the various members of IMCO to the proposals.

Wind heel and passenger heel criteria were first published in 1919 by the American Marine Standards Committee. After 1952, when the Coast Guard first published regulations requireing all cargo vessels subject to inspection to be inclined and a stability report made available, improvements in stability regulations have occurred:

- In 1962 for the U.S. Navy, when intact stability criteria were established following the loss of four destroyers in 1944. These were later formalized in a Navy Design Data Sheet, DDS-079-1. These criteria included a wind line criterion based on Pierrottet's work, heel in a high speed turn, heel due to lifting weights on and off, and heel due to shift of passengers and crew shifting to one side of the ship.

- In 1964, following a series of accidents to offshore supply boats, when the Coast Guard issued an informal requirement based on the Rahola criterion, first published in 1939.

- In 1968 when IMCO produced a recommended interim criterion for fishing vessels, first published in the United States as "Navigation and Inspection Circular No. 6-68", 12 Sept. 1968. This requirement was based on the Rahola principle, but with modifications to the particulars of angle of heel above which the maximum righting moment must occur, and the amounts of righting energy to be available at specified angles of heel.

5.5.2 COX NOV 77

"The Evolution of Safety Requirements for Dynamically Supported Craft", by J.M. Cox, published in Hovering Craft and Hydrofoil, Nov. 1977, Vol.17, No. 2, pp. 27-37.

This report outlines the steps taken on an international level to make a first cut at developing safety standards for commercial sized dynamically supported craft. Dynamically supported craft is a craft defined as one which is operable on or above the water and which has characteristics so different from those of conventional displacement ships, to which the existing International Conventions apply, that

alternative measures should be used in order to achieve an equivalent level of safety. Appendix A of the report discusses Buoyancy, Stability and Craft Subdivisions. For the non-displacement and transient modes it lists the stability requirements that should apply as:

1. Within approved operational limits, the craft should return to her original attitude after a disturbance causing roll, pitch, heave or any combination of these disturbances.

2. Roll and pitch stability to be determined experimentally and recorded prior to entering service.

3. Precautions to be taken against the probability of dangerous inclinations or attitudes and loss of stability being introduced if surface piercing structures or appendages are damaged in collision with a submerged or floating object.

4. Conformation that structures and components fitted to sustain operation should, in the event of agreed damage or failure, provide adequate residual stability so that the craft may proceed to its nearest place of refuge subject to cautious handling.

5. When cushion deformation is used in designs to assist craft control, and cushion air exhausting to atmosphere for maneuvering, the effects on cushion borne stability should be ascertained and any limitation on its use by virtue of the speed and attitude of the craft established.

Appendix A of the report outlines the requirements for the dynamic stability investigation which could be adopted for the critical design conditions, for hydrofoil boats, and outlines proposals for assumed damage.

5.5.3 IMCO NOV 77

"Code of Safety for Dynamically Supported Craft", International-Governmental Maritime Consultive Organization (IMCO) Resolution A.373(X) adopted on 14 November 1977.

This document is the latest resolution adopted by IMCO on 14 November 1977. It is stated that "this code will be reviewed by IMCO at intervals preferably not exceeding two years to consider revision of existing requirements to take account of new developments in design and technology." (See USCG JULY 72, with short abstract, contained in the General Bibliography, for a description of the procedures necessary for the revision of IMCO Regulations.) A summary of the contents of Resolution A.373(X) is given by COX NOV 77 as described in the foregoing abstract, Chapter 5.5.2.

5.5.4 GOLDBERG FEB 74

"Current Status of U.S. Navy Stability and Buoyancy Criteria for Advanced Marine Vehicles", by Goldberg, Tucker, AIAA/SNAME Paper No. 74-332, February 1974.

This paper outlines the intact and damaged stability and buoyancy criteria used by the U.S. Navy for advanced marine vehicles in a hullborne mode. The criteria, rather than being based on rigorous analysis of ship motions, are based on the craft static stability with the extent of roll assumed to be caused by a fully arisen sea based on the design sea state capability of the vehicle. It should be noted that an attempt has been made to allow for dynamic effects of wind, sea and ship rolling. The objective of these criteria is to provide the high performance ship with the same stability and reserve buoyancy capabilities as its equivalent conventional monohull ship. The problem of determining a standard which is equivalent to that which has been adopted for conventional monohull ships is in part overcome by evaluating each ship on an individual basis and relating "equivalent" more to craft displacement and mission capabilities than to craft length. The criteria are considered to represent attainable design goals and provide the vehicle a reasonable capability of withstanding the effects of hazards to which it may be exposed.

5.5.5 MORRALL APR 79

"Capsizing of Small Trawlers", by A. Morrall, RINA Paper No. 12, Spring Meeting, April 1979, London.

This paper presents the results of an investigation into the behavior in rough water and breaking waves of two inshore fishing vessels having almost identical principal dimensions and displacement but with different static stability characteristics. This investigation was done on 1/15 scale radio controlled models with one model representing an inshore trawler built of steel with a transom stern and the other an inshore trawler built of wood and having a rounded stern. The majority of the data was visual, supported by films, although subsequent motions were recorded. In the Coastal type waves experiment both models exhibited satisfactory behavior with the model having the transom stern rolling considerable more than the other model. This was attributed to the fact that the model with the transom stern had a GM of 0.732 m full scale compared to a GM of 0.908 m full scale for the other model. For the experiments in breaking waves the maximum wave height produced by the resulting breaking wave in any given sample was 4.9 m full scale which was felt to be most realistic of actual conditions that could be encountered during operation of inland fishing craft. In head seas both models exhibited severe motions again with the model having the transom stern rolling more. During circular maneuvers the transom stern model capsized on many occasions while the other model survived circular maneuvers with relative ease and even survived a test period of one hour full scale. It was concluded that the model with the transom stern had insufficient stability at rest. Both models experienced capsize when their stability at rest was close to the IMCO minimum. The report is considered to provide valuable background material although not directly related to dynamically supported craft.

5.5.6 STORCH JAN 78

"Alaskan King Crab Boat Casualties", by R.L. Storch (of University of Washington, Seattle) published in SNAME "Marine Technology", 1 Jan.1978, pp. 75-83. Remarks: Work sponsored by NOAA Sea Grant Program.

A casualty review of the Alaskan king crab fleet is used to provide insight into the causes of the high loss rate experienced by these boats. The casualty data

include a general overview and more detailed discussion of 13 specific cases. Based on the casualty analysis, recommendations are made concerning vessel arrangements, stability analysis and vessel operations. (Author) Although not directly applicable to dynamically supported craft the study provides interesting background to boat stability problems.

5.5.7 BROWN JAN 79

"Stability at Large Angles and Hull Shape Considerations", by D.K. Brown, published in "The Naval Architect," RINA, January 1979.

Estimates of stability, both initial and at large angles, are required in the very early stages of ship design so that suitable dimensions and a form may be chosen. It is still quite likely that this first choice is found to have inadequate stability when full calculations are carried out and that some correction is required.

A number of approximate expressions which lead to the initial height of the metacentre are defined. The report also explains that there has been little or no published work in which similar expressions are deduced for the righting lever at larger angles. In the report a considerable amount of warship data are plotted and analysed from which relationships are deduced between the righting lever at 30° and some form coefficients.

At angles greater than 30° the above water hull form is seen to dominate the curve of righting levers and some hydrostatic data for World War II escort vessels is included. This report presents an interesting, yet simple, approach providing significant insight into design factors which influence ship stability.

5.5.8 BOE OCT 75

"Criteria for Safety at Sea" by C. Boe and A. Foleide, United States Coast Guard, Proceeding, Oct. 1975.

Not read due to unavailability. It is understood however, that the purpose of the paper is to report on investigation into risks to human life from shipping technology. The conclusions drawn may assist in establishing high-level safety criteria for shipping. The investigation comprizes an attempt to measure safety at sea as it can be observed at present. Furthermore, the investigation includes the study and utilization of methods and techniques for measuring and evaluating risk levels. This report should be obtained and may well prove of significant value to the program.

5.5.9 KASTNER

"Capsizing of Ships in a Longitudinal Irregular Seaway", by S. Kastner, Schiffstechnik, Schroedter and Company, no date, pp. 11-20.

Not read due to unavailability. It is understood however, that a method is introduced for the statistical determination of the rolling behavior of a ship in a longitudinal irregular seaway, at large roll angles. The time varied irregularity in the variation of the righting moment is represented by a normalized spectrum. The discussion of certain characteristic capsizing events and the statistical evaluation of the computed time periods until capsizing, is described. The probabilistic approach to ship safety presented in this report may well be of significant interest to the program.

5.5.10 TRANSPORT, CANADA OCT 71

"Proposed Interim Guidelines for Subdivision and Stability of Air Cushion Vehicles in the Displacement Mode", Dept. of Transport, Canada, ASDB 10-U07701M, Oct. 1971. Remarks: Approved by M.S.C. for ACV's and Hydrofoils.

Not read due to unavailability, but is expected to contain information of value to the program.

6. SUMMARY AND INTERPRETATION

The background study has resulted in the accumulation of four comprehensive sets of references on the stability of each of the four classes of craft examined, and a fifth set covering reports dealing with more than one class of craft and other general matters connected with stability. These sets of references have been organized alphabetically by source or author and each has been bound separately to facilitate use. The contents of the documents in each set have been identified on a series of reference sheets, one sheet for documents falling under each letter of the alphabet. These sheets categorize the data included, and include an annotation to indicate levels of significance within the specified categories.

Many of the reports (for example 35% of Planing Craft Bibliography) have abstracts included with their citations. Reports identified as being of unusual importance to further activities such as stability standard formulation have been annotated, and their areas of usefulness have been noted and critiqued.

In compiling and critiquing the bibliographies the following two principle objectives of the study were kept in mind:

(i) to provide sufficient insight for classifying dynamically supported craft according to craft susceptible to like stability standards.

(ii) to provide enough resources to begin the formulation and evaluation of intact stability standards.

The background study is believed to satisfy both requirements for all four classes of craft considered.

All four types of craft, although differing in geometry and in principle of operation have many stability considerations in common. They all travel at high speed over the surface of the water and have to be designed not only to be statically stable in pitch and roll but also to be sufficiently resistant to such hazards as tripping, broaching, slamming and plow-in.

In Table 6-1, for example, stability related hazards that could be encountered by dynamically supported craft are listed. The list is organized into primary modes of motion and the likelihood of exposure of each class of craft to a particular hazard is identified. The extent to which each class of craft is susceptible to a common hazard would, of course, be dependent on many detail design variables. It is planned, however, to develop this investigation further in support of task 2 of the current program, to determine to what extent common stability standards can be developed for all dynamically supported craft and to determine whether specific stability standards are required for each specific craft type.

Table 6-1. Classification of Craft Types and Types of Instability.

TYPES OF INSTABILITY[1]				HAZARD IDENTIFICATION[8] — TYPES OF CRAFT[2]			
DESCRIPTION	MODE	PRIMARY D.O.F.[9]	SECONDARY D.O.F.[9]	Planing Craft · Mono Hulls · Multi-Hulls	Hydrofoil Craft · Surface Piercing Foils · Fully submerged Foils	Surface Effect Ships · Full length Sidehulls · Partial length Sidehulls	Air Cushion Vehicles · Bag-Finger Skirt · Multi-Cell Skirt
PITCH							
Plow-In	Divergent	Θ	Z X	✓	✓	✓	✓
Porpoising	Oscillatory[7]	Θ	Z	✓	-	-	-
Pitch-Click[3]	Oscillatory	Θ	-	-	-	✓	✓
Aero Pitch-Up[4]	Divergent	Θ	Z	✓	-	-	-
Pitch-Pole	Divergent	Θ	ZX	✓	-	-	
YAW							
Broaching	Divergent	ψ	Y	✓	✓	✓	✓
Fish Tailing	Oscillatory	ψ	Y	-	-	-	-
ROLL							
Tripping[5]	Divergent	φ	ψ,Y	✓	✓	✓	✓
Click-Stop	Oscillatory	φ	-	-	-	-	-
Dutch-Roll	Oscillatory	φ	ψ	-	-	-	-
HEAVE							
Foil Broaching	Divergent	Z	Θ,φ	-	✓	-	-
Bottom Slamming	Oscillatory	Z	Θ	✓	✓	✓	✓
Heave Limit Cycle	Oscillatory	Z	-	-	-	✓	✓
SURGE							
Loss of Dyn. Lift[6]	Divergent	X	Z,Θ	-	✓	-	-
Loss of Dyn. Lift[6]	Oscillatory	X	Z,Θ	-	✓	-	-
SWAY /SIDE SLIP	Divergent	Y		✓	✓	✓	✓

NOTES: D.O.F.: Degree of Freedom; Θ: Pitch; ψ: Yaw; φ: Roll; Z: Heave; X: Surge; Y: Sway

1. Types of instability to be established further during Phase I, Task 2.
2. Craft types and their various configurations.
3. Bow down excursions due to intermittent skirt tuck-under. Prelude to plow-in.
4. Craft Pitch-up at high speed due to aerodynamic instability.
5. Sudden increase in side drag with craft progressing at high-sideslip or beam-on.
6. Loss of lift on foil in following seas.
7. All oscillatory modes might lead to divergent-oscillatory mode.
8. Hazards which have been known to cause or are likely to cause death, injury or property damage.
9. Degree of Freedom.

APPENDIX A
STATE OF THE ART REVIEW OF CRAFT STABILITY

1. Amphibious Air Cushion Vehicles

The stability and control problems of fully-skirted ACVs have been more severe than those encountered with conventional surface ships. These problems have arisen largely from the fact that since resistance to forward motion has been decreased due to the air cushion so has the resistance to lateral motion. This is compounded by operation at relatively high speeds and by the fact that under certain conditions relatively large hydrodynamic forces and moments can occur with skirt contact, which must be countered almost entirely by aerodynamic means.

Such stability problems were first encountered in July 1961 when the SRN-1, with short skirts, encountered what was then called the "plow-in" phenomena. This was a violent pitch down at 60 knots which caused the hardstructure to impact the water surface giving a 12 g deceleration. To cope with intermittent wave contact, the SRN-1 was fitted with a hydrodynamic bow, and hence did not overturn.

The serious nature of the ACV stability and capsizing behavior became apparent, however, in early 1963 from the results of model towing tank tests and full-scale tests of the Saunders Roe* SRN-2 and SRN-5 which were the first ACVs to have bag-type skirts. The first ACV overturning incident occurred on a self-propelled, radio-controlled, 1/7.5 scale model of an SRN-5 in October 1963.

Following this incident, Saunders Roe instituted a program of model testing in an effort to define the conditions associated with overturn and to evaluate the skirt configurations which were used on the several Saunders Roe vehicles. Unfortunately they were unable to duplicate the high-speed overturn which had occurred on the SRN-5 model but they did find that overturn could be produced by towing the model beam on. This test consisted of towing the model beam-on through the hump-speed region and applying roll moments to the craft such that the leading side would be depressed. The applied moments were increased until the craft overturned. The actual applied moment which produced overturn was then used as a criterion for assessing the stability margins of the ACV. This test was subsequently adopted by Saunders Roe and other ACV manufacturers as the standard for investigation of overturning characteristics (Reference A1).**

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*In 1963 Saunders Roe (England) was a division of the Westland Aircraft Company. Later, the same company was renamed the British Hovercraft Corporation (BHC).

**For Reference List see p. A-25.

It was not until 8 April 1965 however, that the first full-scale ACV overturning incident occurred involving an SRN-5 operating at Alesund, Norway. This was followed shortly after (May 11, 1965) by a similar incident with an SRN-5 operating on San Francisco Bay. As a result, further studies in this country and in England were initiated (References A1 through A8). Bell Aerospace, for example, performed fairly extensive stability investigations of their Hydroskimmer, SRN-5 and SK 5 craft, while under contract to BUSHIPS. In England, Saunders Roe continued with their stability investigations with support from the government sponsored Hovercraft Development Limited (HDL).

As more ACVs were built, further capsizing accidents occurred and eventually in England in 1975, the Civil Aviation Authority (CAA) published a report (Reference A9) of the Air Registration Board's (ARB) Special Committee on Hovercraft Stability and Control. This committee solicited help from all the leading authorities in government laboratories and industry to review the various mechanisms of capsizing and to consider what parameters should be measured during certification trials. A list of all known capsizes is given, some of which are discussed. Factors which have contributed to capsizing are listed and a range of suitable values for the most critical design parameters are quoted. Results of model tests performed using the HD-2 research craft are analyzed in detail and suggestions for further research are listed. A summary of some of the most significant capsizing events (Reference A22) is given as follows:

SRN-5-001, April 65. Craft overturned during a pirouette to starboard in glassy calm conditions. Pirouette entered at approximately 40 kts and the port bow ploughed in at a side slip angle of 65°. Actual overturn occurred at slow speed, probably 8 kts to 10 kts. Stability keel had been split along its entire length.

SRN-5-007, May 65. Driver under instruction, turned craft to starboard at high speed. With a yaw angle of 35° to 45° the port bow ploughed in and the craft capsized when the speed had reduced to about 8 kts to 10 kts. No skirt shift control was applied. Sea was calm with no wind.

SRN-5-005, July 66. Craft was doing 35 kts to 40 kts and a turn to port was commenced. At a yaw angle of 45° the bow dipped and craft ploughed in on starboard bow and overturned. Sea was glassy calm with no wind. Skirt was in poor condition prior to the overturn.

CC5-001, October 66. Craft turned to port from a downwind run in 2 ft high by 30 ft long waves. With the craft at a yaw angle of 35° to 45° a roll to starboard over a wave crest occurred. The starboard side did not pick up and water rolled over the starboard sidebody and the craft overturned downwind to starboard.

HA5Mk.III, March 71. Craft overturned while operated by inexperienced crew who probably closed the lift engine throttle during a turn. Wind was gusty and the sea choppy.

Air Cycle, May 71. Craft turned to port while traveling downwind. Engine power was reduced and the craft overturned sideways.

HA5Mk.III, June 71. Craft traveled downwind over a lake (driver quoted craft speed as 25 m.p.h., shore observer quoted speed at 60 m.p.h.). Port engine cut in a turn to port. Yaw built up to 90° when lift engine power was reduced. Starboard side skirt tucked under and craft rolled over. Wind speed 9 kts to 13 kts.

SRN-6-012, March 72. The SRN-6 accident of March 1972 occurred in severe conditions, including a strong tide and gale-force winds, with steep waves up to 8 ft high and 25 ft to 60 ft long. Overturn (port side down) occurred with the relative wind between the starboard aft quarter and the starboard beam, and the predominant sea direction (opposing the ebb tide flow) was on the starboard beam. Craft track and sideways drift speeds were of order 10 kts.

HA5Mk.II, date not know. Craft overturned on a lake in relatively shallow water. Wind speed was 25 kts, craft was being handled by a trainee driver. While going into a port turn the craft drifted sideways at approximately 90° yaw and rolled over.

Reference A9 also provides brief details concerning capsizing events with eight (8) privately constructed ACVs in addition to identifying some 19 other private ACVs which have been known to capsize, but for which details are unavailable concerning the circumstances involved. Events and conditions which have resulted in near capsizes are also not widely publicized.

In review of Reference A9, however, it appears that ACV capsizes have occurred in both calm and rough water, as well as overland with the major contributing factors being:

(a) that, as a result of a maneuver, the craft was traveling at high side-slip angle or beam leading at some time during the capsize.

(b) distortion of the skirt system has occurred when the inflated structure was at less than design pressure as a result of skirt damage or operator reduced lift air flow rate.

(c) the hydrodynamic shape of hard structure at points of water contact (including buoyancy tank dead-rise, etc.) were not conducive to resisting a capsize.

In addition to the above conclusions, it is apparent that capsizes have occurred with craft which otherwise have behaved satisfactorily. This tends to suggest that consideration must be given to the danger of capsize in all types of craft. Many of the craft which have capsized have subsequently been modified, however, and in most instances no further capsizing incidents have been noted. These necessary modifications, which varied in nature from craft to craft, were developed gradually by a process of extensive model and full-scale testing and via an improved theoretical understanding of the various important modes of instability as discussed in the following chapter.

There has been a continuing activity both in this country and abroad in developing an understanding of ACV stability probelms. In the United States, analytical and experimental studies including those performed by Aerojet General (AGC) and Bell Aerospace (BAC) in support of the U.S. Navy's AALC and Arctic SEV programs have been particularly productive.

In the AALC Program, for example, both the AALC JEFF(A) and JEFF(B) designs have been the subject of numerous, subscale, model stability tests at DTNSRDC, Stevens Institute of Technology, Hydronautics, Lockheed Ocean Labs and at the contractors' (AGC and BAC) own facilities. These tests have included:

- Towing-tank, constant- and variable-speed, captive and free-to-pitch-roll and beam stability tests conducted for variations in sideslip angle, lift-air flow rates and applied destabilizing moments.
- Forced-oscillation towing tank tests using a planar motion mechanism (PMM) for determining both static and dynamic stability terms.
- Captive, rotating-arm tests for determining hydrodynamic yawing moment terms.
- Self-propelled, "Round-the-pole", tethered-model tests over land and water.
- Free-flight, self-propelled model tests for determining maneuvering stability and reduced lift-air-flow plow-in boundaries. These tests have also helped to determine control authority and its effect on stability.
- Wind tunnel tests to determine the aerodynamic destabilizing moments.
- Surf tests, in head, following and oblique seas.

Full scale tests of the BAC Voyageur, LACV-30, Viking and SK5s have also revealed valuable information, particularly for understanding scale effects when interpreting the results of model tests.

The Arctic SEV Program conducted by DTNSRDC is another example of a program in which considerable stability-related data has been generated for ACVs. This program emphasized the need for increased skirt height for negotiating the Arctic topography and placed extreme demands upon improved levels of craft stability. The Advanced Naval Vehicle Concept Evaluation (ANVCE) Program, although not responsible for generating much new technology, has been very active in reviewing the state-of-the-art, and has already provided a collection of relevant studies conducted both in this country and abroad.

However, in spite of this considerable wealth of knowledge related to ACV stability, there has until recently been virtually no attempt to establish a recognized set of rational stability standards.

The ACV designer, has for the most part, relied upon very simple, rule-of-thumb guidelines for adequate cushion stiffness and for the selection of basic dimensionless geometric factors which are subsequently proven (or assumed to be proven) adequate by extensive model testing and theoretical motion simulation.

Before embarking upon a discussion of these basic design guidelines, it is considered important at this stage to state our understanding of the fundamental principles of ACV stability. This is presented as follows:

Pitch Stability

When an ACV, at zero forward speed, is caused to rotate in pitch, the center of gravity will be displaced with respect to the center of lift of the main air cushion. In order that the craft be statically stable in pitch, a restoring moment must be generated of greater magnitude than this destabilizing effect.

There are three mechanisms by which a restoring moment can be generated by the craft; all three of which are available in most ACVs.

- By changes in skirt attachment loads round the periphery of the craft. This effect will be primarily due to skirt and bag contact with the water or ground surface on the down-going side of the craft effecting the magnitude and direction of the tension forces applied by the fabric to the hull. A change in load between the surface and the skirt is transmitted to the craft at the attachment point.
- By changes in the distribution of cushion pressure on the underside of the craft. This effect can only be present if the cushion is divided into two or more compartments.
- By a shift in center of cushion area with pitch or roll due to the inward angular orientation of the skirt periphery.

When the ACV is in forward motion, these stabilizing forces are still present but additional effects are introduced. As the craft is disturbed from a near level trim, additional drag is incurred by the skirt system. This drag will act approximately at the surface, and will produce a bow-down moment whether the craft is rotated bow up or bow down. The moment will therefore be stabilizing bow up, and destabilizing bow down. If the destabilizing moment is sufficiently large, the craft pitch angle will diverge in a bow-down direction, until hard structure contact occurs. Additionally, the drag forces acting on the skirt at the water line will cause the skirt hemline to "tuck under" which will distort the bow skirt rearwards, thus moving the center of area of the cushion aft to cause a loss in available restoring moment.

This mode of instability is known as plow-in and it will occur on any ACV at a sufficiently high speed and large bow-down attitude. It is desirable that the occurrence of plow-in should be delayed so that it is outside of the normal operational envelope of the craft. In the event that operational limits are exceeded, the operator is warned of an impending plow-in by a characteristic sound and by the deceleration as drag builds up on the bow skirt. The corrective action is then to reduce propeller pitch, which has the following beneficial effects:

- It reduces thrust, which immediately (for most ACVs) provides a bow-up moment.
- It slows the craft, which reduces skirt drag.
- For an ACV with integrated lift and propulsion, reduced thrust also results in power reduction at the propeller which allows the system rpm to increase. This then adds fan power and provides more bag pressure and cushion flow. The increased bag pressure increases resistance to skirt distortion, and the additional cushion flow reduces skirt drag.

Fortunately, reduction in propeller pitch is an instinctive reaction to an impending plow-in. This is the primary reason why existing ACVs do not normally encounter the problem during passenger service, even though they may readily be plowed-in during tests or demonstrations.

After a plow-in has progressed to the point of hard structure contact, the deceleration experienced will be largely dependent upon the bow hull shape. It is possible, however, to prevent bow contact by incorporating a sealed compartment within the bow bag which is commonly referred to as an anti-plow-in bag. The craft then planes on this bag until the speed falls to a value at which recovery from the plow-in can take place.

If plow-in is excessive, however, the craft can experience a high degree of directional instability which can lead to higher than desirable side-slip angles. Problems associated with directional stability are identified in the next paragraph.

Directional Stability

An ACV is unique in being capable of operation with air or water sideslip angles of any magnitude. The desired directional stability of such a craft is therefore a compromise between the requirements at different times.

Typically, during cruise, sufficient directional stability is desirable to enable a steady course to be maintained "hands-off" the controls. If instability is present, the craft will diverge in yaw, but the relatively low destabilizing moments available and high yaw inertia will ensure that the motion will be slow. The craft operator can readily handle such an instability if adequate control power is available, but it increases his workload considerably and is an undesirable condition.

If excessive directional stability exists during cruise, the craft will be difficult to maneuver. Also, it will be likely that the same factors producing high yaw stiffness at forward speed will produce large unstable moments with a tail wind component.

The total yawing moment acting on the craft will be the sum of components from aerodynamic and hydrodynamic forces. The aerodynamic characteristics of the hull will always be destabilizing, and inlet momentum drag will be destabilizing if the inlets are ahead of the c.g. The contribution from the propulsive device will depend upon thrust generated, but should always be stabilizing.

The contribution from skirt hydrodynamic forces will depend upon the craft pitch attitude, which under normal operation, will depend upon c.g. location.

Roll Stability

The mechanisms by which restoring moments are generated in roll are essentially the same as those described above for pitch. Since the cushion beam is less than the length, the skirt and cushion restoring forces will have smaller moment arms in roll than in pitch. The relative displacement of the c.g., however, will remain unchanged, and so the craft stiffness in roll will be less than that in pitch.

At large sideslip angles, an instability in roll is possible, corresponding to skirt tuck under and plow-in during normal forward motion. This mode, however, is potentially more hazardous than normal plow-in for the following reasons:

- Reduction of propeller pitch will not result in a direct restoring moment in roll.

- A high c.g. height to cushion beam ratio can result in large roll attitudes, and even complete overturn.

Heave Stability

Static heave stability is derived from the change in cushion pressure that accompanies a change in hover height combined with the change in cushion area as the skirt deforms on contact with the surface. If the pressure/flow characteristics of the lift system are such that a decrease in flow is always accompanied by an increase in pressure, the craft will be statically stable in heave over the entire range of weight and cushion depth possible. A centrifugal lift fan will ensure this, while an axial fan installation must be carefully designed to avoid the stall region during normal operation. As the craft is brought off cushion by a reduction in rpm, a stall in the fan may result in a higher vertical velocity at ground contact.

Even though statically stable, an oscillation in heave may be induced by a phenomenon known as "seal bounce". This results from a relatively high frequency oscillation of the seal and was experienced during the initial run-up of the SRN-3 and AALC JEFF(A) after a change in seal design. The seal oscillation is only slightly unstable, and minor restraint with tension chords or diaphragms is all that is necessary to eliminate it.

Design Guidelines to Resist Capsize

The United Kingdom Air Registration Board have provided (Reference A9) some basic rule-of-thumb guidelines for the selection of basic design parameters which can effect ACV stability and resistance to capsize. Their basic concern was for the prevention of roll-over resulting from skirt tuck-under during a high side-slip or beam-on maneuver. Their design factors affecting craft reserve against roll-over (or capsize) up to the point of tuck-under are shown in Table 5.2 of Reference A9, whereas, the factors actually affecting skirt tuck-under, are shown in Table 5.1 of Reference A9. These design guidelines are essentially no different from those adopted in this country in the design, for example, of the AALC JEFF(A) and JEFF(B) as discussed in Reference A10.

2. Rigid Sidehull Surface Effect Ships

The only known case of a rigid-side hull SES having insufficient stability to resist a capsize occurred with the U.S. Navy's XR-1 test craft on December 8, 1964 while operating on the Delaware River. In this case the craft was performing a turning maneuver when an unstable roll condition occurred (Reference A9). In the process the test craft heeled out of the turn, venting cushion air from the starboard side of the bow seal, a phenomena seen many times with the XR-1 fixed seals. The bow seal retracted automatically due to its force-balancing system. The craft then nosed down, continuing its outboard roll until it flipped over, skidding on its back (Reference A11).

The XR-1 (which has since been substantially modified*) had approximately twice the length to beam ratio relative to more recent designs such as the HM2, SES 100A and 100B. The craft, with a wet deck height of approximately 3.3 ft, was apparently traveling in 6 ft waves.** It was thought that a contributory cause was the high CG coupled with the high length/beam ratio. Limited model tests were subsequently conducted on a 1/7 scale model of the XR-1 during 1965. These tests were a small part of an experimental program designed to look at the effects of configuration changes on stability. The results are reported in Reference A12 which states that: 'It was felt that the instability which occurred on the XR-1 test craft was caused initially from venting of the plenum due to inadequate roll stability, thus leading to a heave-yaw instability'.

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*The present day version is the XR-1D which is currently (April 1979) being tested at the SES Test Facility, Patuxent River, Maryland. The craft now has a more conventional length-to-beam ratio of approximately 2.5.

**Reference A9 quotes 6 ft. waves which seems rather high for the Delaware River.

The tests also indicated that the craft rolled outboard in the turn due to the high deadrise angle (60°) of the craft sidehull combined with its low cushion-beam to cushion-height ratio of 2·86. This combination resulted in the lateral force vector (perpendicular to the sidehull deadrise angle) being directed below the center of gravity. As the craft rolled outboard, the cushion vented under the inboard sidehull, lowering the cushion pressure, resulting in an increased immersion of the outboard sidehull. The increased immersion of the full-length sidehull resulted in the center of pressure of the lateral force on the sidehull moving forward of the longitudinal CG, aggravating a yaw instability. The condition continued to worsen until the craft capsized.

The previous paragraph described the conclusions derived from the model test results. However, the model did not have a hydrodynamic rudder, whereas the test craft did. An effect of the rudder is to generate favorable roll-in moments while turning. During the test mission in which the XR-1 rolled over, the helmsman had the rudder positioned to hold the craft in the turn. As the craft got into a turn tighter than desired, the helm was reversed, resulting in a roll moment which rolled the craft further outboard.* It is evident, therefore, that the form of directional control and its use, or misuse, can have a significant influence on the initiation or aggravation of a series of events which could lead up to a capsizing situation. Control misuse should, to a certain extent, be simulated during full-scale trials.

Subsequent design and development of the U.S. Navy's SES-100A and SES-100B rigid-sidehull SES test craft have benefitted considerably from the XR-1 experience. Although these craft have exhibited an uncomfortable tenderness in pitch, they have both operated up to their design sea state-speed envelope with no apparent serious stability problem. Stability experience gained with these two craft is summarized below: -

During high-speed, smooth-water testing conducted in late 1972, the SES-100A experienced several, unexpected, bow-down, "plow-in" events. High accelerations were experienced by the craft. There were however, no casualties and only minor damage to the seals resulted. An "interim", single-membrane, bow seal was installed at that time. Significant cushion-pressure gradients ($P_{bow} < P_{stern}$) were recorded in each case, which apparently contributed a substantial bow-down pitching moment.

A modified version of the baseline, deployable, bow seal was then installed, and large, fixed, bow stabilizers were added. No subsequent plow-in events have been experienced.

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* An additional effect was due to the relatively rigid bow seal design which apparently aggravated the capsizing sequence. Modern day seals are more compliant and do not suffer from this problem to the same extent.

Bow-down pitching moments, sometimes accompanied by similar cushion pressure differentials, had been recorded during the original 1/8-scale model tests which supported SES-100A design. These characteristics were corrected by design provisions and adjustments in the baseline deployable bow seal plus bow stabilizer relocation, as demonstrated during the 1/8-scale verification model tests.

Reduced pitch stiffness and cushion-pressure gradients under some conditions have also been recorded during subsequent 1/12-scale model testing and also during full-scale operation.

Stabilizing foils and fins were initially sized and installed to provide the total pitch, roll and yaw restoring moments without consideration of contributions provided by the seals. While this approach appeared unduly conservative at the time, model test results of the original configuration agreed reasonably well with calculations.

Pitch stiffness is an item of special concern for a rigid sidehull SES, since the lateral center of pressure on the sidehulls moves forward as the craft assumes a negative trim until the sideforce acting on the forward edge of the sidehulls, due to a slight yaw angle, cannot be overcome by the directional stabilizers, and results in yaw divergence. Pitch stiffness must therefore be sufficient to prevent the craft from assuming pitch-down attitudes below a specified limit in order to prevent yaw divergence. The pitch trim boundaries to avoid yaw divergence for the SES-100A are shown in Figure A-1. (Reference A13).

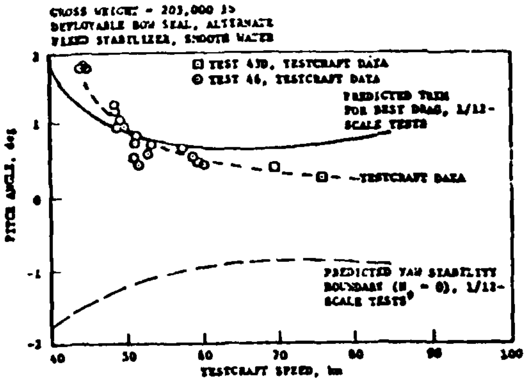


Figure A-1. Yaw Stability.

The pitch/roll stabilizers, which resulted from the design philosophy of separation of functions, consist of a pair of foils mounted at the end of an actuator which may be extended or retracted by the operator. The normal procedure is to trim the testcraft by c.g. control and then to set the stabilizers so that the lower foil is just skimming the water surface in calm water. In waves the stabilizers would be positioned so as to minimize pitch motions induced by wave action.

The stabilizers were sized to provide all the predicted restoring moment required at 40 knots. Therefore, they provided more than was required at higher speeds due to their greater hydrodynamic effectiveness.

The movable pitch/roll stabilizer has satisfactorily performed the function for which it was designed, but the static pitch stiffness remains less than that predicted by model testing or analyses.

The existence of the adverse pressure gradient/bow-down moment phenomena for certain SES configurations is a significant consideration in SES design and development, which is, as yet, not fully understood. Part of the work being performed by Rohr Marine, Inc. in support of the 3KSES and SES-100A program is directed toward resolving this problem.

SES - 100B Pitch Stability

Expansion of the operational envelope for the SES-100B has been gradual, not only in terms of speed and sea state but also with respect to pitch attitude, roll attitude, sideslip, rudder angle, and rate of rudder deflection. Red line limits were set, based upon model data, to avoid areas of potentially unstable operation. These potentially unstable areas are indicated by published plow-in boundaries, "pitch-click" instability predictions, and lateral/directional stability boundaries.

The "pitch-click" instability was predicted from the results of the series of model stability tests conducted in 1972 at the Davidson Labs of Stevens Institute. These tests predicted a region of local instability near the level trim condition as speed increased from 35 to 50 knots. At 65 knots, the model data predicted an unstable slope between approximately +1/3 degree and -1/3 degree. This characteristic indicated that the craft would "click" from +1/3 to -0.8 degree when trimmed bow down through zero. This phenomenon was subsequently observed during full-scale operations.

The risk of overstepping stability boundaries is increased by operation at high speed and at small values of pitch attitude. At no time, however, has model behavior predicted the SES-100B to be in any danger of overturning should these boundaries be exceeded. However, even at moderate speeds (40 knots) the craft has many times the kinetic energy required to overturn, so any boundaries of stability must be approached with extreme caution.

Unlike the SES-100A the SES-100B has no additional pitch stabilizing appendages and pitch stability is derived only from the seals and sidehull shaping. Although the bag-finger bow seal on the SES-100B apparently does not generate a significant adverse cushion pressure gradient, an increase in seal and sidehull pitch restoring moment contribution or the addition of pitch stability appendages would more than likely eliminate the so-called "pitch-click" instability, although at the expense of a loss in performance.

SES-100A Heave Stability

A severe "limit cycle" oscillation in heave has been observed with the SES-100A when running at high speed with a full cushion and near optimum trim. Under these conditions peak-to-peak heave acceleration amplitudes in excess of 1.0 g have been recorded. The oscillations occurred three times during SES-100A test operations on 13 March 1973 (Test No. 38).

In all cases the craft was conducting a high-speed run (50 knot speeds). In the first two events operations were being conducted with two lift fans. In the last event three fans were being used. Pitch trim attitudes were near optimum and the stern seal was in an extended position. In each case the oscillations were stopped by reducing lift air flow rate and raising the stern seals. Perhaps the most significant factor is that sea conditions were calm (wave heights generally less than 1 or 2 inches).

Analysis of this limit cycle (Reference A14) has shown it to be a manifestation of the usual heave instability associated with plenum chamber type Air Cushion Vehicles.

Perhaps the most significant aspect of the heave limit cycle phenomena is that it provides a look at a problem which will become more significant in the future as larger SEV's are designed and built.

Stability While Maneuvering

Because the motion of an SES is confined principally to the horizontal plane the prime controls are fore-and-aft and directional. Over water, the ability to accelerate quickly from rest and to stop quickly, if necessary by ditching, makes the SES particularly responsive by displacement ship standards.

The maneuvering, control and stability problems of the rigid sidehull SES and also the fully skirted ACV are generally more severe than those encountered on more conventional surface vehicles. The problems of controlling the fully skirted SES arise largely from the fact that since resistance to forward motion has been decreased due to the air cushion, so has the resistance to lateral motion. This is compounded by the fact that under certain conditions, particularly when operating in waves, relatively large, intermittent, hydrodynamic forces and moments can occur which must be countered almost entirely by aerodynamic means. For a rigid-sidehull SES the resistance to lateral motion (due to sidehull draft) is, invariably, relatively high. However, much larger changes in hydrodynamic forces and moments can develop, as compared to an ACV, for quite small changes in operating attitude which can lead to problems of instability. Such changes in operating attitude must therefore be kept to a minimum, particularly at high speed*. The result, in the specific case of yaw stability, can be a highly directionally stable configuration which is consequently not particularly easy to maneuver. As in the case of the maneuverability versus the stability of the airborne jet fighter the SES must exhibit a compromise between performance and safety which will vary depending upon operational requirements.

*Rigid sidehulls and sidehull stability appendages are also sensitive to flow separation and cavitation at high speed if sideslip angles are not kept to a minimum.

Whether the maneuvering of a craft may or may not involve a significant hazard is a governing consideration in the selection of stability and maneuverability criteria. If a potential hazard is involved, the maneuvers to be referenced in evaluating a design must be restricted to assure the craft's safety; and the available safety margins, in addition to performance factors, would be of importance in assessing the design. If there is no potential hazard, the craft's performance can be assessed solely in terms of the most extreme maneuvers within the vehicle's capability.

For example, during turning, a displacement ship encounters no significant danger. Accordingly, its maneuverability is generally assessed in terms of the tightest turns that can be obtained. The most commonly used criteria are the characteristics of the turning circles obtained with maximum rudder deflection, e.g., tactical diameter, advance, transfer, etc.

For the SES, experience has shown that, at least for some designs, turning conditions can be imposed upon the vehicle which can lead to excessive roll angles and, ultimately, to capsizing. When operating in the on-cushion mode with small sidehull immersion depths, the center of mass of the vehicle will be relatively high above the water surface. Hence, to the extent that the side forces associated with a turning maneuver act horizontally along a line of action that is close to the water surface, the vehicle can be subjected to comparatively large rolling moments. For a given speed this upsetting moment increases with the tightness of the turn. Since the roll-restoring moment derived from hydrostatic effects does not increase proportionately with speed, the occurrence of large roll angles and the danger of capsizing increases with increased speed.

These considerations have led to the assessment of SES stability and turning performance in terms of the attainment of specified turning radii or lateral accelerations in steady turns at high speed, such specification replacing the minimum attainable turning radius criterion. The implication is that, while turns tighter than those associated with the specification may be attainable, they might entail some degree of danger and would not be attempted under normal circumstances.

Although the current state-of-the-art has not yet advanced to the point where the safety problems involved in high speed SES turning can be dismissed lightly, there are, however, indications that as the pertinent factors become well understood and appropriately reflected in the vehicle's design, safety considerations will not be the primary factor in imposing limitations on maneuverability in turning. Some of the design features which can be brought to bear to provide positive assurance of safety are as follows:

- Appropriate selection of the beam to obtain satisfactory values for the basic geometric ratios, such as the length/beam, cushion-height/beam and c.g. height/beam ratios.

- Provision of adequate free-board above the sidehulls to provide a safety margin for roll angles beyond the point at which the "wet-deck" is immersed.

- Selection of sidehull deadrise angle so that the line of action of the hydrodynamic side forces generated on the sidehulls is inclined to produce small or favorable rolling moments.

Provision of turning skegs to provide adequate side forces while retaining small sidehull sideslip angles. The skegs can be appropriately canted so as to produce negligible or favorable rolling moments.

- Selection of rudder deflection rates so as to avoid undesirable roll transients without significant penalty to maneuvering characteristics.

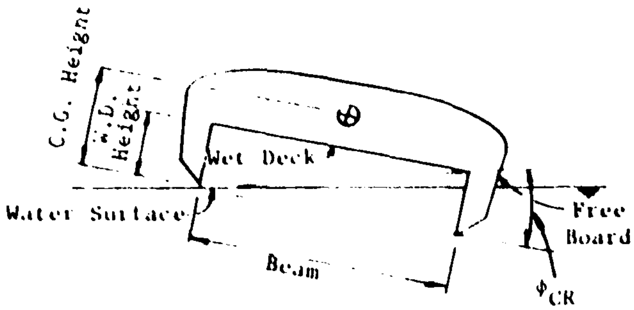
- Provision of hydrodynamic roll stabilizers which maintain adequate roll restoring moments throughout the operational speed range. Hydrodynamic roll stabilizers can also be mounted high on the sidehulls to limit the sidehull immersion depth that could ever be obtained at high speeds.

These concepts are illustrated in Figure 2-2.

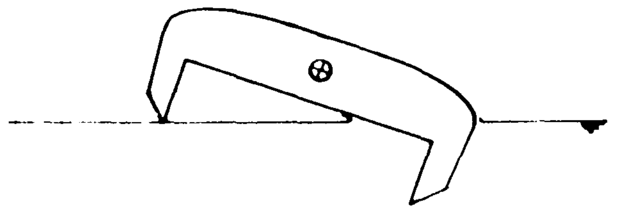
SES Response to Plow-In While Turning

The effect of negative pitch angles, i.e., plow-in conditions, can be studied by examining the transient response obtained when entering a turn. Although this transient response is revealing in evaluating the vehicle's turning characteristics when it is at negative pitch angles, it is unrealistic in that the operators are unlikely to call for a turning maneuver after the vehicle has plowed-in. Presumably, action would be taken to slow down and maintain a straight-line course in so far as possible. In fact, this procedure has been followed by most test crews without difficulty. However, a more realistic situation, in which plow-in might endanger the craft, is where it occurs while the craft is executing a tight turn at nominal trim. A sudden plow-in in this case would lead to a considerable increase in the steady-state turning rate obtained with the rudder deflection used to turn at nominal trim, and this rudder deflection would be present and would be applied until the operators respond to the situation and take action to come out of the turn. If it is assumed that the operators do not respond but simply hold the rudder deflection fixed, then the craft will enter the turn corresponding to the pitch-down attitude. It is felt that this represents the worst transient excitation that might be encountered. Therefore, this transient response should be simulated for all craft to provide further data for assessing craft safety.

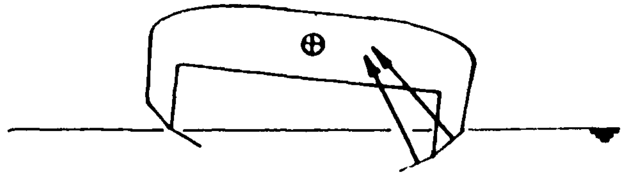
3KSES stability standards have been established on the basis of experience with other craft; in particular the SES 100A, 100B and XR-1D. It implies that since these prior craft recover safely from the same specified angular orientation and that since these craft have behaved satisfactorily throughout their operational envelope, then the 3KSES, if designed to meet the same standard, will also behave satisfactorily for operation within a similar or scaled equivalent operational envelope. Although far from a totally adequate standard the simplicity of the approach will allow a straightforward approach to the sizing and shaping of stability appendages, etc. via a relatively limited use of a very expensive 6-degree of freedom simulation.



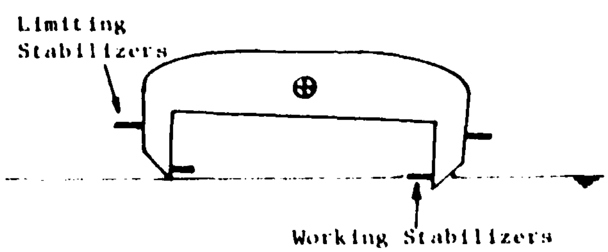
With appropriately small cushion height/beam and C.G. height/beam ratios, the roll angle at which the wet deck contacts the water surface will be relatively small and at this point the moment arm of the hydrostatic restoring force will still be reasonably large.



Submergence of wet deck and free board then provides greatly increased restoring moment before saturation.



Sidehull dead-rise angle and canting of turning skeg can be chosen to obtain minimum or favorable rolling moments.



Hydrodynamic stabilizers can be used to retain adequate roll stability and to limit sidehull immersion depths at high speeds.

Figure A-2. Concepts for Designing an Uncapsizable SES

SES Lateral Stability

As mentioned previously, the possibility of rolling over in the presence of large side forces acting on the sidehulls is the main consideration with regard to the safety of a rigid sidehull SES. To operate at high speed in the on-cushion mode, the sidehull depth of immersion must be kept small, and, for effective operation in waves, a reasonably large clearance must be allowed between the bottom of the wet deck and the bottom of the sidehulls. Design restrictions generally require that the c.g. be somewhat above the bottom of the wet deck. Hence, the craft normally rides with its c.g. relatively high above the water surface, so that the forces acting on the sidehulls can have relatively large roll moment arms and can produce large overturning moments.

It may be assumed that when the vehicle rolls in response to an overturning roll moment, the up-going sidehull does not rise above the water surface. If it rose further, a large leakage area would appear under the sidehull, resulting in a drop in cushion pressure. Consequently, the vehicle's heave position would be reduced, under the action of the vehicle's weight, until the leakage gap is effectively closed. This would restore the sidehull to the water surface, consistent with the foregoing assumption.

When consideration is restricted to near zero roll angles, the variation of each of the moment contributions with roll angle can be taken to be linear. Stability then depends upon whether or not the slope of the restoring moment exceeds the slope of the sum of the overturning moments; if so, the craft is stable at zero roll angle (with zero sidehull immersion); if not, the craft is unstable at zero roll angle. However, in the latter case, stability may be reached at a non-zero roll angle, provided that, as the roll angle increases, the nonlinear increase in the restoring moment exceeds the non-linear increase in the overturning moment. When the side velocity is reasonably small, the craft then comes to a stable equilibrium at a small roll angle with the down-going sidehull partly immersed.

As the side velocity is increased the equilibrium roll angle increases and the immersion of the down-going sidehull increases. Eventually a point is reached where the sidehull is completely immersed and the bottom of the wet deck touches the water on the down-going side as illustrated in Figure 2-2. The roll angle at which this condition is encountered is given by:

$$\phi_{CR} = \tan^{-1} \frac{z_B}{b}$$

where z_B is the cushion-height, i.e., the distance from the bottom of the wet deck to the bottom of the sidehulls, and b is the beam of the craft.

Generally, at the point where ϕ_{CR} is reached, the hydrostatic lift of the sidehulls will still have a large roll moment arm. Hence, after this point is passed and the wet deck becomes increasingly immersed, as illustrated in Figure 2.2, the restoring moment will increase at a much greater rate. However, eventually a point would be reached where, because of the reducing roll moment arm and/or saturation of the available free-board, the restoring moment no longer increases as fast as the overturning moment increases. This point would define the extreme limit of roll stability.

Because of the complexities that are then involved in representing the hydrodynamic upsetting moment as well as the restoring moment, it is difficult to treat conditions obtained at roll angles beyond ϕ_{CR} on generalized analytical basis. For analytical purposes the point at which the roll angle reaches ϕ_{CR}, i.e., where the wet deck begins to become immersed, is most often taken as the limiting condition. The envelopes that define this limiting condition will invariably fall short of the ultimate limits of stable operation. Hence, these envelopes represent a very conservative bound for the limits of stable operation.

3. Hydrofoil Craft

It is not certain whether the motivation of the earliest experimenters with hydrofoils was primarily drag reduction, to achieve higher speeds, or the alleviation of wave disturbances to improve riding qualities at high speeds, in rough water. The latter is one aspect of stabilization, but it must have been evident at once that a free running vehicle would require stability in all of its possible modes of motion. Thus stability requirements have been central to the design of the strut and foil systems of all hydrofoils.

All hydrofoil craft incorporate a hull, to which the strut/foil system is attached, and are capable of operation as conventional hullborne ships. Indeed the achievement of a minimum flying speed is an essential preliminary to foilborne operation. Since the takeoff speed is high, as measured by the Froude number, for present day craft of moderate size, the hulls closely resemble those of the planing craft discussed in the following section.

Hullborne stability requirements are similar to those for conventional ships and are addressed in the same way by the naval architect. Attention must be given to the weight of the struts and foils which, if retractible, can significantly effect the height of the center of gravity. The retracted foils contribute a significant "sail" area which must be taken into account when considering wind loads. The extended struts and foils contribute a useful augmentation to roll and pitch damping, providing a demonstrated reduction of roll and pitch motions and a corresponding improvement in seakeeping capability. Nevertheless a situation can be envisioned, in breaking storm seas on the beam, where the resistance to lateral motion provided by extended struts prevents the ship from yielding to the lateral wave force and may accentuate the hazard. In spite of this hypothetical limitation, hullborne operation remains a refuge for hydrofoils when the severity of sea conditions precludes foilborne operation, or in the event of casualty. Thus hullborne stability is a dominant design requirement.

At speeds approaching takeoff the characteristics of the ship are essentially those of a planing craft, but with the possible addition of stability augmentation from the strut/foil system. With increasing speed the foil system begins to dominate and the stability is properly addressed under a discussion of foilborne performance.

Hydrofoil craft may be distinguished by differences in foil planform arrangement, in the type of foil used (whether fully submerged, or inclined surface piercing or the equivalent ladder), and by the provision--or not--of movable surfaces for stabilization and control. Different degrees of foilborne stability are attained, an increase generally being achieved at the expense of larger foil size--hence weight and encumbrance and drag--or of the complication of control flaps or incidence variability and an automatic control system for their application. As a consequence the needs of the intended service have dictated the design of the foils and the degree of stability provided.

Achievement of stability in pitch always requires separate forward and after foils, regardless of the type of foils employed. The forward foil usually provides the primary height control function, with the after foil designed to follow it. Stabilization in roll may be assigned either to the forward or after foils or divided between them. Directional stability depends on appropriate proportioning of the effective lateral area between the forward and after strut/foil assemblies.

The first successful hydrofoils used surface piercing foils and such foils are used on a majority of the ships in service in the Western World today. Since the foils extend above the foilborne water line there is, when foilborne, a reserve of lifting area available for the generation of righting forces. It is inherent in such systems that the ship is stabilized to the water surface. Thus contouring of long waves is a natural tendency as is a considerable roll response. At low foilborne speeds the height is reduced as is also the stability in roll, which may become marginal just before takeoff. For these reasons some later surface piercing foil ships have been fitted with control flaps or movable foil tips with automatic controls to improve roll stability. Perhaps the most advanced surface piercing hydrofoil is the Canadian Navy's BRAS d'OR for which a seakeeping ability even higher than the U.S. Navy's fully submerged, automatically controlled ships is claimed.

Another foil system providing inherent, passive stability has been developed by Rostislav Alexeyev in Russia and widely used there. Stability is obtained from the effect of surface proximity which reduces the lift as a foil approaches the surface to a limiting value one half that at deep submergence. The foils are horizontal and run fully submerged at a depth of about half their chord. The resulting performance is adequate for service in rivers and lakes where sea conditions are essentially calm, and a large number of such craft have been put in passenger service. More recent Russian craft, intended for coastal or Black Sea operation, have added surface piercing foil elements for roll stability augmentation. One of the latest ships, TYPHOON, is fitted with fully submerged foils with trailing edge flaps and an automatic control system to provide adequate seakeeping up to Sea State 4.

Hydrofoil development in the United States has been dominated by the Navy which, since 1960, has concentrated on fully submerged foil systems, with their concommitant automatic control. Four Navy ships, the 58 ton TUCUMCARI, the 67 ton FLAGSTAFF, the 120 ton HIGH POINT and the 235 metric ton PEGASUS, have demonstrated a capability to fly in seas with a significant wave height equal to the keel elevation above the foils. The three smaller ships have all flown in seas half again as high but admittedly not without being forced down onto their hulls occasionally. The outstanding characteristic of these ships is their exceptionally smooth ride in rough water. Until the wave height reaches the point where hull contact with wave crests cannot be avoided, the presence of the sea is scarcely evident to one below decks. With the high deadrise hulls presently employed, a considerable degree of wave cresting can be accepted without encountering intolerable impact.

Heave, Pitch and Surge

For reasons concerned with strut drag and weight, and pitch and roll stability, the length of struts and hence the running depth of the foils is limited to a modest fraction of the ship length. Consequently, in severe seas the ship may alternately crest the waves or broach the foils in the hollow of a wave, either of which constitutes a loss of heave and pitch stability in the mathematical sense. Wave cresting produces impact loads on the hull, for which it must be designed, but otherwise only discomfort for crew and passengers. Broaching generally occurs only with the forward foil(s) and results in an immediate, almost complete loss of lift. The bow falls and the foil reenters the water. Full lift is not regained immediately, because the reentering foil remains ventilated to the atmosphere for some time, and the hull almost invariably slams into the next wave. Foilborne operation is usually regained after the next wave passes but, with increasing sea severity, a point is reached where the loss of speed due to past-broach slamming is too great and flight must be abandoned. This constitutes, of course, an overpowering instability in surge.

The scenario described above is typical of submerged foil ships with a canard foil planform. Hydrofoils with an airplane configuration almost invariably encounter asymmetrical broaching with the result that a rolling moment is induced. Considerable roll may develop before lift is recovered on the broached foil and may persist until the hull slams in. This type of coupling will be addressed further in the subsequent discussion of roll stability.

We do not know the extent to which forward foil broaching is encountered on ships with surface piercing foils. Since the bow has a greater tendency to lift in response to an approaching wave crest than that of a fully submerged foil ship, there could be a greater tendency to broaching. On the other hand, since speed would normally be lower in heavy seas, the foil may be submerged deeply enough to obviate the problem.

It is reported that forward foil broaching on the Canadian Navy ship, Bras d'Or was not unusual. This foil is lightly loaded, carrying only about 10% of the ship weight, and is mounted very far forward. The design of this foil is unusual, however, being intended to operate fully ventilated at all times. Thus, upon reentry after a broach, normal lift is reestablished more rapidly than on a foil running normally fully wetted. In any event no serious motion perturbations have been reported.

Despite the perhaps alarming tone of the description above, no serious hazard has appeared as a result of symmetrical forward foil broaching. The hull forms used, characterized by high deadrise forward and ample freeboard and reserve buoyancy, permit the ship to accept the occasional bow slamming which occurs or, in the limit, to retreat to hullborne operation at reduced speed if necessary.

Another circumstance leading to surge/instability involves foilborne operation in following seas which are typically being overtaken. Climbing the back of the wave, with the water running away from the ship, can so far reduce the relative flow velocity over the foils that insufficient lift is obtainable and the ship settles onto her hull. This is more of a problem for surface piercing foil ships, than for submerged foils with lift control, because compensation for the loss of flow velocity cannot be obtained. In any event it is not considered to present any serious hazard.

Roll

Like most other ships, hydrofoils are typically much less stable in roll than in pitch. At the same time some upsetting rolling moments may be larger than those encountered in pitch so that provision of adequate roll stability is a matter of the highest priority.

Because the hull, when foilborne, is high above the water and has typically rather high freeboard and perhaps an extensive superstructure, the overturning moment due to wind loads is large. Also the centripetal force required to turn is developed on the struts and foils far below the center of gravity so that a large overturning moment may result. The reliable generation of sufficient righting moment is required for roll stability.

Righting moments are developed by surface piercing foils, in reaction to ship roll, by increased immersion of the low side and corresponding emergence on the high side. Thus, roll stability requirements dictate the foil span and dihedrel, or may lead to the fitting of anhedral foil/strut elements which increase the rate of area variation. Twist of the foils may be employed to increase the effectiveness of the tips. Simple tests may be conducted by operating foilborne with off-center ballast weight aboard to measure the initial stability, as suggested in Reference A15.

Because surface piercing foils develop a righting moment only by heeling, it is inevitable that they will roll or bank outward in a turn. Reduced speed brings increased danger of foil tip submergence and a limit to the increase of righting moment. Thus, turning maneuvers must be restricted at low foilborne speeds. Hullborne operation is the ultimate refuge in case of difficulty in roll and can be achieved only by slowing down

With fully submerged foils rolling moments are generated by changing the incidence of split foils or by deflection of ailerons. Thus the ship can be kept nearly upright even under the action of heavy wind loads or asymmetric passenger loading. Present control practice is to bank the ship into a turn so that very little righting moment is required. Thus a maximum rolling moment capability is reserved to counter wave disturbances. Turning is limited by the necessity to avoid broaching of the foil tip on the outside of the turn, which will dictate a lower flying height in rough water than in smooth water.

The possible consequences of asymmetrical foil broaching has been alluded to earlier. In addition to the rolling moment resulting from the asymmetric loss of lift, the loss of height leads to a command for increased lift which can only be achieved on the still-submerged foil, which accentuates the roll. This process can be countered by the introduction of a roll acceleration term into the control with sufficient authority to slow the development of roll response.

Because of the ever present hazard of possible excessive roll, simulation studies are made, (Ref.A16), to determine the effect of control system malfunctions or failures so the helmsman may be alerted to situations requiring immediate landing. The automatically controlled, fully-submerged foil ships can be landed very quickly by reducing the commanded flying height and cutting the throttle.

Yaw-Sway

Yaw instability makes steering a more difficult task though not necessarily impossible if the degree of instability is slight. The achievement of yaw stability depends on the proper distribution of strut area between forward and after struts and on the maintenance of adequate foil submergence. The most serious hazard involves an after foil broach, especially with a conventional or airplane foil configurations, which may result from an excessive bow down pitch excursion especially in following seas. Increasing yaw and the resulting sway, or side slip, could induce large rolling moments and a danger of capsize. This is one reason why the U.S. Navy prefers the canard foil configuration, (Ref. A17). The eventuality is rendered improbable by the strong pitch stability of hydrofoils, especially those with automatically controlled, fully-submerged foils. Excepting the accident to the high-speed, experimental U.S. Navy craft FRESH 1 in 1963 no hydrofoil is known to have suffered such a yaw, roll instability leading to a capsize.

Motion Studies

Not surprisingly, since highly complex subsystems are involved, the development of fully submerged foil ships has involved the application of sophisticated and comprehensive design procedures. The same capability should suffice for the design of the simpler surface piercing foil ships.

Central to the dynamical analysis are vehicle equations for motion analogous to those developed for use in the design of aircraft and submarines. Important terms in these equations represent the hydrodynamic forces on the struts and foils and their dependence on the motion of the ship, the movement of control surfaces and the action of the sea. Appended to the basic vehicle equations are equations describing the control surface response to ship motions and the helmsman's commands as dictated by the automatic control system and produced by electro-hydraulic servo systems. The resulting dynamical system is considerably more complex than the ship alone with fixed controls.

Initial stability is examined by study of linearized simplifications of the equations of motion, using stability root analysis methods developed for servo system design. The result permits establishment or verification of important foil and strut dimensions and control system parameters (Ref.A18). This analysis is not adequate, however, to assure satisfactory and safe performance in rough water. For this purpose the complete equations must be used, including non-linear hydrodynamic and control system relationships (Reference A19).

Important non-linearities in strut and foil hydrodynamics result from stalling, from cavitation and from ventilation as well as flow separation on control flaps and foil free surface broaching. Increasing understanding of these limiting hydrodynamic phenomena has been derived from st ll ongoing model tests. Control system non-linearities include necessary mechanical limits as well as relationships deliberately introduced to deal wi possible extreme motions.

Solution of the complete, nonlinear equations of motion is facilitated by the use of modern computers to establish a simulation of the complete dynamical system. Continuous time histories of the ship motion are generated, permitting an examination of all aspects of ship maneuvers and response to ocean waves. An important feature of computer simulation is the capability to explore the effects of control system failures and other casualties without danger to the ship and crew (Reference A16).

Despite impressive developments in dynamical simulation techniques, the recovery of foil lift after post-broach reentry, for example, has not yet been sufficiently well defined to permit its inclusion in computer simulations. In such areas dependence must be placed on the results of full-scale trials. The extensive program carried out by the Navy's Hydrofoil Special Trials Unit in Bremerton has generated a wealth of experience and data for the guidance of future hydrofoil design. Of critical importance has been the interaction between the trials program and the simulation, the former serving to verify--or sometimes to suggest required improvements in--the latter while the simulation was used to guide the progress of the trials and to point up possible hazards.

4. Planing Craft

Compared with other types of dynamically supported craft the planing craft is well known and has been in wide use for very many years. The principles of planing lift are well understood; a great deal of theoretical and experimental work has been devoted to the study of resistance of planing hulls and very large numbers of successful and safe planing craft have been built for military, commercial and private use. The stability of planing craft, however, is an extremely complex subject and very little analytical work has been done on this subject (see, for example, Reference A20 and A21). One reason for this is that there has not been very much incentive. Stability problems of planing craft have, traditionally, been solved empirically and successfully by simple, practical remedies such as the use of ballast to move the center of gravity or the use of transom flaps or "shingles" to

change the running trim angle. In any case the modes of instability that do occur during the operation of planing craft at moderate speeds are normally rather mild and can be avoided by the operator by changing trim (by thrustline or transom-flap control), by changing speed or by moving passengers or crew. Observation of any of the nation's waterways on a weekend in the summer indicates that planing craft can suffer wide ranges of operational abuse in terms of loading, speed and turning maneuvers without displaying undesirable, unstable tendencies.

Displacement Mode

The planing craft is very often much less stable in the displacement mode than when planing. This is particularly true of the deep-vee types and much less true of tri-hull types. The Seaknife, for example, which can be regarded as an extreme case of a deep-vee type is undesirably unstable when at rest. The fact that many small craft are rather prone to swamping and capsize when at rest has been the cause of many accidents.

Porpoising

The coupled pitch and heave instability known as "porpoising" is probably the most commonly experienced mode of instability encountered in planing craft. At moderate speeds it can be persistent but is usually not very severe. Once porpoising starts it will usually not die out until either the trim is changed or speed reduced. At high speeds porpoising can be extremely dangerous as it is aggravated by large aerodynamic forces and can rapidly build up until the craft leaves the water entirely, which can cause the craft to flip or can cause such severe impact loads that the craft breaks up. Such accidents are not infrequent among racing hydroplanes.

Roll Stability -

Most planing craft are very stiff in roll when in the planing mode as a large restoring moment is generated when one side of the planing bottom is immersed further than the other. Some deep-vee types exhibited poor roll stability in initial trials but it was found that this could be remedied very simply and effectively by fitting longitudinal spray strips on the planing bottom. During turning maneuvers the V shape of most planing bottoms provides a favorable rolling moment as the craft sideslips, so that the craft will roll inwards in a turn. Occasionally, in deep-vee types coupled roll and pitch instability can occur if the forefoot digs in during a turn and causes the craft to roll outboard. The prototype Seaknife, for example, which has a very deep forefoot, was destroyed when it capsized in this way by "tripping" and rolling outboard in a turn.

Directional Stability

The directional stability of planing craft is usually very good in calm water. The center of hydrodynamic lateral effort is well aft of the c.g. so that the craft is statically stable in yaw and does not require the continuous adjustments of the helm that are characteristic of displacement ships.

Stability in a Seaway

The same geometric characteristics that cause a planing craft to have very stable characteristics in calm water cause it to have a rough ride in waves. As the craft moves through waves the area of the planing bottom in contact with the water changes rapidly and the planing force changes in proportion. The resulting accelerations and motions get rapidly more severe as speed and wave height increase and usually result in the operator reducing speed until a more comfortable situation is obtained. This usually means that the planing craft only encounters severe sea states in the displacement condition. The planing craft in the displacement condition in a seaway has several disadvantages compared with a displacement ship:

- The large areas of superstructure often present may cause large rolling moments due to windage and large angles of roll due to high roll inertia.
- The shallow draft may interact with the waves to cause unusual variations in waterplane area and hence metacentric height.
- The shallow draft may also result in directional instability in following seas leading to broaching.
- The wide square transom and open cockpit areas may be prone to swamping in following seas.

Only in very unusual circumstances, such as in ocean racing, will planing speeds be maintained in rough water. Under these conditions very high accelerations are experienced and structural damage and crew injuries are not uncommon.

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BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY SUPPORTED CRAFT

VOLUME II

A CATEGORIZED BIBLIOGRAPHY OF
AMPHIBIOUS ACV STABILITY RELATED REPORTS

by

David R. Lavis
Edward G.U. Band
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Edgar D. Hoyt

Task 1 Report
Contract No. DOT-CG-806510-A

for

U. S. Department of Transportation
United States Coast Guard
Office of Research and Development
Washington, D. C. 20590

INTRODUCTION

This document contains a categorized bibliography of Air Cushion Vehicle (ACV) stability related reports. It is one of a series of bibliographies which have been prepared for the United States Coast Guard's (USCG's) investigation of the stability of dynamically supported craft. The other bibliographies in this series are:

- A Bibliography of Rigid Sidehull Surface Effect Ship (SES) Stability Related Reports.
- A Bibliography of Hydrofoil Craft Stability Related Reports.
- A Bibliography of Planing Craft Stability Related Reports.
- A General Bibliography of Ship and Small Craft Stability Related Reports.

Entries in the bibliography have been made in alphabetical order using the Author's company (or affiliation) or Author's last name if his company and affiliation are unknown or are less descriptive of the source.

A "Reference Evaluation and Subject Index" table is provided for each group of alphabetical entries. These tables provide an indication of the relevance or value of each document to the study of craft stability and also places each within one of nine separate subject categories. The value of each document to the subject of craft stability has been indicated by assigning a letter A, B, or C to each entry using the following classification.

A: First Class Material, Important to Program

B: Supporting Material

C: Useful but not Essential to Program

The subjects into which each document has been categorized are defined as follows:

Full Scale Operations, Static

Report contains full scale information of a non dynamic nature, e.g. static stability testing, (craft stationary and/or at forward speeds) and/or general steady state operational behavior, including operators overall assessments.

Full Scale Operations, Dynamic

Report contains full scale information on craft dynamic behavior, e.g. seakeeping, maneuvering, response transients, dynamic stability, or dynamic behavior in general including operators overall assessments.

Model Tests, Static

Report contains model test information of a non-dynamic nature, e.g. craft and component static stability testing (model stationary and/or at forward speeds), calm water resistance tests, including test results and/or descriptions of test techniques.

Model Tests, Dynamic

Report contains test information on model dynamic behavior, e.g. towing tank or free (maneuvering) model dynamic tests, dynamic transient tests, seakeeping including surf tests, results and/or description of test techniques.

Analytical Studies, Static

Report contains analytical studies related to craft static stability.

Analytical Studies, Dynamic

Report contains analytical studies related to craft dynamic stability, e.g. analyses of craft capsizing, seakeeping, maneuvering, motion response, acceleration response, hull slamming, survivability.

Accident Reports

Report contains a specific account of,comment on,or analysis of a craft stability related accident which has resulted in property damage, personal injury or loss of life.

Criteria

Report contains information on craft stability related criteria, e.g. specific criteria or standards, design guidelines or practices for adequate craft stability, human tolerance to craft motions, safety limits, regulatory issues and standards.

Environment

Report contains information concerning weather conditions, e.g. wind, sea state, icing etc. Report may also contain information on forcast and hindcast techniques, and probabilistic description of severity.

The bibliography has been compiled from a fairly comprehensive search of the following sources.

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It is understood that a background of very significant information exists with the Ship and Marine Technology Requirements Board of the British Government's Department of Industry. This information, generated principally by the Hovercraft community in the United Kingdom, has not been obtained for inclusion in this issue of the bibliography.

GLOSSARY

AALC	AALC Program Office
AAMC	Army Advanced Material Concepts Agency
AEW	Admiralty Experiment Works
AFFDL	Air Force Flight Dynamics Laboratory
AFSC	Air Force Systems Command
AFSTC	Army Foreign Science and Technology Center
AGARD	Advisory Group for Aerospace Research
AGC	Aerojet-General Corporation
AHI	Atlantic Hydrofoils, Inc.
ALRC	Aerojet Liquid Rocket Co.
AMC	Army Material Command
ARL	Admiralty Research Laboratory
BAT	Bell Aerospace Textron
BHC	British Hovercraft Corp.
BILES	J.H. Biles and Co., Ltd.
BLA	Band, Lavis and Associates, Inc.
BOEING	Boeing Co.
BRITISH AIR	British Aircraft Corp., Ltd.
BRITISH ARB	British Air Registration Board
CAA	Civil Aviation Authority
CASI	Canadian Aeronautics and Space Inst.
CIT	Cranfield Institute of Technology
CRREL	Cold Regions Research and Engineering Lab
DAEDALEAN	Daedalean Associates, Inc.
DRT	Development and Resources Transportation Co.
DSI	Developmental Sciences, Inc.
DTC	Department of Transport, Canada
DOT	Department of Transportation
DTNSRDC	David Taylor Naval Ship Research and Development Center
EEAL	English Electric Aviation Ltd.
FHC	Fairchild Hiller Corp.
FML	Frederick Muller Ltd.
FROST	Frost Engineering Development Corp.
GRUMMAN	Grumman Aircraft Engineering Corp.
GCAM	Garrett Corporation AIResearch Manufacturing Div.
GD	General Dynamics Corp.

HAWKER	Hawker Siddeley Aviation, Ltd.
HDL	Hovercraft Development Ltd.
HILLER AIR	Hiller Aircraft Corp.
HOVERCRAFT	Hovering Craft and Hydrofoil
HRRO	Human Resources Research Organization
HYDRONAUTICS	Hydronautics, Inc.
JOHNS-MANVILLE	Johns-Manville Research Center
JN.HYDRONAUTICS	Journal of Hydronautics
JSR	Journal of Ship Research
KELLETT AIR	Kellett Aircraft Corporation
LINGUISTIC	Linguistic Systems, Inc.
LMSC	Lockheed Missiles and Space Co.
LLOYD'S	Lloyd's Register of Shipping
MIT	Massachusetts Institute of Technology
NAL, JAPAN	National Aerospace Lab., Japan
NASA	National Aeronautics and Space Administration
NAVSEC	Naval Ship Engineering Center
NISC	Naval Intelligence Support Center
NPL	National Physical Laboratory, England
NPRD	Naval Personnel Research and Development
NRC	Netherlands Research Center
NSMB	Netherlands Ship Model Basin
NSW U.	University of New South Wales
NYAS	New York Academy of Sciences
OCEANICS	Oceanics, Inc.
PNEUMO	Pneumo Dynamics Corporation
RAC	Republic Aviation Corp.
SIT	Stevens Institute of Technology
Southampton U.	Southampton University, England
TRG	Technical Research Group
USATS	United States Army Transportation School
VKI	Von Karman Institute for Fluid Dynamics
VRC	Vehicle Research Corp.
VTL	Vosper Thornycroft Ltd.
WALKER	N.K. Walker Associates, Inc.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
ANON, AUG, 62	-	C	-	-	-	-	-	-	-
" MAY, 65	-	A	-	-	-	-	A	-	-
" JUNE,65	-	-	-	-	-	-	-	C	-
" SEPT,65	-	A	-	-	-	-	A	-	-
" NOV, 65	-	A	-	-	-	-	A	-	-
ANON, 65	-	A	-	-	-	-	A	-	-
" AUG, 66	-	-	-	-	-	-	-	B	-
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AFSC, 70	-	-	-	-	-	-	-	C	-
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" FEB, 71	C	C	-	-	C	C	-	-	-
" DEC, 73	-	C	-	-	-	-	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

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" FEB, 74	-	-	C	-	C	-	-	C	-
" -	-	-	-	-	C	C	-	-	-
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" 68	-	-	-	-	-	C	-	-	-
AGARD, 69	C	C	C	C	C	C	-	-	-
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" JAN, 70	C	C	-	-	-	-	-	-	-
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" JAN, 74	-	-	B	B	B	-	-	-	-
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" JAN, 77	-	-	-	-	C	C	-	-	-

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" FEB, 74	-	-	C	-	C	-	-	C	-
" -	-	-	-	-	C	C	-	-	-
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" FEB, 74	-	-	B	B	-	-	-	-	-
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" DEC, 76	-	-	-	-	B	B	-	-	-
" JAN, 77	-	-	-	-	C	C	-	-	-
" JAN, 77	-	-	-	-	C	C	-	-	-

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ARL, OCT, 73	B	B	B	B	B	B	-	B	B

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AEW DEC 72	"Vosper Thornycraft Hovercraft VT1-001 Speed, Maneuvering and Seakeeping Trials Preliminary Report", by J. Charlesworth, Admiralty Works, Haslar, England, ASDB 10-U05141LM, Dec. 1972. Remarks: Contains data on seaworthiness, speed-power, turning and internal noise characteristics.
AFFDL JUNE 66	"Light-Line-Tethering Technique for Determining the Aerodynamic Derivatives of an Air Cushion Vehicle", by G. Kurylowitch, Air Force Flight Dynamics Laboratory, ASDB 10-U06774M, (AD640209), June 1966.
AFSC 70	"Criteria of the Longitudinal Stability of the Ekranoplan", by R.D. Irodov, Air Force Systems Command, English Trans., Vol.1 No.4, 1970, p.63-72, (AD-A002918).
AFSTC OCT 69	"Surface Effect Vehicles", by N.I. Belavin, Army Foreign Science and Technology Center, Washington, D.C. Rept No. FSTC-HT-23-437-69, 174 p, 1969.
AFSTC FEB 71	"Air-Cushion Vessels", by G.P. Zlobin, Y. A. Simonov, Army Foreign Science and Tech. Center. Charlottesville, VA, (AD733499), Feb. 1971. Remarks: Characteristics, hull strength, stability, and maneuverability of ground effect machines operating over water.
AFSTC DEC 73	"Terraplane", by R. Chaube, Army Foreign Science and Technology Center, FSTC-HT-23-0341-74, ASDB 10-U06503LM, (AD021013L), Dec. 1973.
AFSTC OCT 73	"Aerodynamics of Air Cushion Vehicles," by V.I. Khanzhonkov, Army Foreign Science and Technology Center, ASDB 10-U05699F, (AD774066), Oct. 1973.

AFSTC FEB 74	"Aerodynamics of Air Cushion Craft", Chapter 6, Second Edition, by I.T. Yegorov, Army Foreign Science and Technology Center FSTC-HT-23-2547-72, (AD786800), ASDB 10-U06995, Feb. 1974. Remarks: Broad ACV Coverage Translation from USSR BOOK; includes wing in ground effect.
AFSTC	"Basic Theories of Air Cushion Vehicles", by Y.Y. Benya, V.K. Dyachenko, Army Foreign Science and Technology Center, Charlottesville, VA. (AD742425).
AGARD DEC 68	"Stability and Control of an Air Cushion High Speed Ground Vehicle" by F.L. Giraud, AGARD, Dec. 1968, pp. 132-162.
AGARD 68	"In Fluid Control: Components and Systems", by S.Y. Lee, AGARD, 1968.
AGARD 69	"A Literature Survey of the Aerodynamics of Air Cushion Vehicles" by A. Harting, AGARD, 1969. Rept 565 (AD-687 974).
AGC DEC 69	"Dynamics of a Multiple-Skirt Air Cushion Vehicle", by L.I. Bickford, G.K. Olson, Aerojet General Corp., Journal of *Aircraft*, Vol. 6, p.564, 565. Remarks: Multiple skirt air cushion vehicle ACV, Pitch and heave dynamic characteristics, describing mathematical modeling and analog computer simulation. Dec. 1969.
AGC JAN 70	"100 Ton SES Waterjet Testcraft Program-Design Description Report; Vol. 1 - (Sections I-III)," ASDB 10-U05368LM, SES-E-A005, Aerojet General Corp., Jan. 1970.
AGC MAR 72	"Stability, Overwater and Moment of Inertia Tests of the 7/100 Scale Model Amphibious Assault Landing Jeff(A) Model Test Report", Aerojet-General Corp., ASDB 10-U03482L, Mar. 1972.
AGC AUG 73	"Jeff(A) Analysis of Habitability Criteria as Obtained from Tests Using NSRDC Motion Measuring Equipment", by R.J. Batholemew, Aerojet-General Corp, AGC-T-406, ASDB 10-U02735LM, Aug. 1973.
AGC OCT 73	"Parametric Design and Concept Exploration Study-Arctic SEV Program Final Report;"Vol.2, by L. Shenfil, Aerojet-General Corp., AGC-T-426, ASDB 10-U04551LF, Oct. 1973, (AD914167L).

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"Conceptual Design 150-Ton ASEV Final Technical Report," Aerojet-General Corp., Rpt-AGC-T-434, ASDB 10-U04645L, Nov. 1973. Remarks: Appendix 1 nonlinear vertical dynamics (mathematical) model appendix 3 fan design appendix 3 resize code (including notation and listing).

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"Amphibious Assault Landing Craft JEFF(A) Model Test Report Hydrodynamic Tests of the 7/100 Scale Verification Model October 1971 Tests Series", Aerojet-General Corp. Rept AGC-T-469, Feb. 1974.

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AGC
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"Point Design Report for 1000 Ton ACV," Aerojet-General Corp., Jan. 24, 1977.

AGC
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"Point Design Report for 200 Ton ACV", for AALC JEFF(A), Aerojet-General Corp., Jan. 24, 1977.

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FEB 71 "Amphibious Assault Landing Craft P30-35 Volume II Design Report", Atlantic Hydrofoils, Inc., ASDB 10-U-3459L, Feb. 1971.

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SEPT 75 "Ride Quality & International Standard TSO 2631", by G. R. Allen, Royal Aircraft Establishment, ASDB 10-U09086, Sept 1975. Remarks: HPL 0530170; Lectures by G.R. Allen on evaluation of human exposure to whole body acceleration.

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MAR 77 "Summary Detail and Construction Report, AALC JEFF(A)", Aerojet Liquid Rocket Co., Rept. AGC-T-603, March 1977.

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FEB 66 "Performance Testing of an Air Cushion Vehicle on the Greenland Ice Cap" by G. Abele, ASDB 10-U07704, Special Rpt 91, Army Material Command, Feb. 1966, (AD632570).

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JUNE 70 "External Aerodynamics of Hovercraft", by E.J. Andrews, Aeronautical Journal, Vol. 74, June 1970, pp. 472-482. Also see Hovercraft World, Vol. 3, May 1969, pp. 68-69, June 1969, pp 91-93. Remarks: External aerodynamics role in handling qualities of amphibious hovercraft, discussing tests of hull shape. air cushion efflux and hollow models.

ARCTEC,INC.
AUG 74 "Model Tests of an Arctic SEV Over Model Ice", Arctec Inc., by E.J. Lecourt, T. Kotras, Rpt TR-0062-9, Aug. 1974.

ARL
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REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
BARNES, JULY, 64	-	-	-	-	-	C	-	-	-
BAT, FEB, 62	B	B	B	B	B	B	-	-	-
" JAN, 64									
BAT, MAR, 64									
" MAR, 64	-	-	-	-	B	B	-	-	-
" JAN, 65									
" FEB, 65									
" APR, 65	-	-	B	B	B	B	-	-	-
BAT, JUNE, 65	-	A	B	B	B	B	A	-	-
" JAN, 66	-	A	B	B	A	A	A	-	-
" MAR, 66	B	B	-	-	-	-	-	-	-
" APR, 66	-	-	-	-	C	C	-	-	-
" AUG, 66	-	A	B	B	B	B	A	B	-
BAT, JUNE, 70	-	-	-	-	C	-	-	B	-
" AUG, 70	-	-	B	B	-	-	-	-	-
" OCT, 70	-	-	-	B	B	B	B	-	-
" JUNE, 72	-	-	B	B	B	B	-	-	-
" AUG, 72	-	-	-	-	C	-	C	-	C

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
BAT, OCT, 72	-	-	B	B	-	-	-	-	-
OCT, 72	-	-	-	B	-	-	-	B	-
OCT, 72	-	-	B	B	B	B	-	-	-
FEB, 73	-	-	-	-	C	C	-	-	-
FEB, 73	-	-	-	-	-	B	-	-	-
BAT, FEB, 73	-	-	B	B	B	B	-	B	-
FEB, 73	-	-	-	-	B	B	-	-	-
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BAT, JAN, 77	-	-	-	-	B	B	-	B	-
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BERTIN, MAY, 67	C	C	-	-	C	-	-	-	-
BERTIN, SEPT, 70	-	C	-	-	-	-	-	-	-
BERTRAND, DEC, 67	-	B	-	-	-	-	-	-	-
BHC, NOV, 66	-	-	B	B	-	-	-	-	-
" MAY, 74	-	C	C	C	-	-	-	-	-
" JUNE, 74	-	-	A	A	A	A	-	A	-
BHC, MAR, 73	-	-	A	A	-	-	-	-	-

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REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
BHC, APR, 75	-	B	-	-	-	-	-	B	B
" JULY, 75	-	B	-	-	-	-	-	B	B
" SEPT, 76	B	B	B	B	B	B	-	-	-
" JAN, 77	-	-	-	-	C	C	-	-	-
" 68	C	C	C	C	C	C		C	
BHC -	C	C	C	C	-	-	-	-	-
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BOEING, JUNE, 72	-	-	C	C	C	C	-	-	-
BOEING, SEPT, 72	-	-	C	C	C	C	-	-	-
" DEC, 72	-	-	C	C	C	C	-	-	-
" APR, 73	-	-	C	C	C	C	-	-	-
" AUG, 74	-	-	B	B	-	-	-	-	-
" AUG, 74	-	-	-	-	C	C	-	-	-
BRESLIN, OCT, 68	-	-	-	-	-	C	-	-	-
BRISTOL U, APR, 70	C	C	-	-	-	-	-	-	-
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BRITISH ARB, FEB, 62	-	-	-	-	-	-	-	B	-

A = 1st Class Material, Important to Program

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REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
BRUNEL U, OCT,74	-	-	-	-	-	B	-	-	-
" " FEB,77	-	-	-	-	-	B	-	-	-
BRUSSELS U -	-	-	-	-	-	B	-	B	-
" "	C	C	-	-	-	-	-	-	-
BUCKLE, JAN, 73	-	-	-	-	C	-	-	-	-
BURGESS, APR, 63	-	-	B	B	B	B	-	-	-
MAY, 74	-	-	-	-	C	-	-	-	-
SEPT,72	C	C	-	-	-	-	-	-	-

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B = Supporting Material

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BAT FEB 62 — "Technical Summary Report Phase I Hydroskimmer SKMR-1", Bell Aerospace Co., RPT-2073-950001, ASDB 10-U-4668, Feb. 1962.

BAT JAN 64 — "USN SKMR-1 Phase III Part A Research Tests Interim Report", by H.K. Hite, RPT-2073-928004, ASDB 10-U04648M, Jan. 1964.

BAT MAR 64 — "Interim Data Report-USN SKMR-1", by F.M. Kuhl, Rpt 2073-928003, ASDB 10-U04606, Bell Aerospace Co., Mar. 1964.

BAT MAR 64 — "U.S.N. SKMR-1 Analog Simulation Studies - March 1964," by F.T. Nielan, R.A. Golonka, Bell Aerospace Co., Rpt-2073-928005, ASDB 10-U04654M, Mar. 1964. Remarks: HPL 0530035; Results of two-degree-of-freedom (yaw and roll) analog motions simulation for the SKMR-1.

BAT JAN 65 — "Research Tests Over Water-USN SKMR-1 Phase III, Part B," by H.K. Hite, T.S. Early, M.W. Brown, Rpt-2073-928012, Bell Aerospace Co., ASDB 10-U04604M, Jan. 1965.

BAT FEB 65 — "Proposal for Research Program on SKMR Roll Instability Phenomenon", Rept. No D7226-953001, Feb. 1965.

BAT MAR 65 — "Flat Bottom Configuration-USN Hydroskimmer SKMR-1 Phase III-A Research Tests", by H.K. Hite, T.S. Early, Bell Aerospace Co., Rpt-2073-928014, ASDB 10-U04602LM, Mar. 1965, (ADB010206).

BAT APR 65 — "Report of Preliminary Analysis and Test of Low Speed Roll Instability USN Hydroskimmer SKMR-1", Bell Aerospace Co., Rpt-2073-950006, ASDB 10-U04669, Apr. 1965. Remarks: Contains two Bell and two Westland reports that form the basis for clearing SKMR-1 to operate in winds to 30 knots.

BAT JUN 65 — "SR-N5 Overturning - Analysis, Modifications and Operational Limits," Bell Aerosystems company Report No. 7500-927004, June 1965.

BAT JAN 66 — "Roll Stability Evaluation of the U.S. Navy Patrol Air Cushion Vehicle (PACV) SK-5," Bell Aerosystems Co, Rept. 7500-9927007, BUSHIPS Contract NObs 4917, Jan. 1966.

BAT MAR 66 — "Design,Construction and Testing-Summary Report", by J.V. Kordenbrock, RPT, 2073-928016, ASDB 10-U04599M, Bell Aerospace Co., (AD481653), Mar. 1966.

BAT APR 66 — "Proposal for an ACV Surf Capability Research Program", Bell Aerospace Co., D7269-953001, ASDB 10-U03188, April 1966.

BAT AUG 66 — "Air Cushion Vehicle Roll Instability Investigation , Bell Aerosystems Report No. 7500-927013, BUSHIPS Contract NObs 4917, Aug. 1966.

BAT JUNE 70 — "C150-50 Hullborne Roll Static Stability Characteristics in the Normal, Damaged and Flooded Condition", by D. Neil, ASDB 10-U-03166L, June 1970.

BAT AUG 70 — "Model Test Measurements of the Forces and Motions in Surf of the Bell Aerosystems Co. ACV Design", by K.L. Kirkman and J. Hill, Hydronautics, Inc. Tech. Rept. 7009-2, August 1970.

BAT OCT 70 — "Preliminary Design Summary Report AALC C150-50-Vol.1," by J. B. Chaplin, Bell Aerospace Co., RPT-7385-950006, ASDB 10-U03128M, Oct. 1970.

BAT JUNE 72 — "Analysis of the B-17A Model Hydrodynamic Stability Data", by G. Cadelli, Bell Aerospace Co., ASDB 10-u07693M, June 1972. Remarks: This report summarizes the cushion-borne stability data for the B-17A Model of Jeff(B) tested at Lockheed tow tank.

BAT AUG 72 — "Arctic Surface Effect Vehicle Program-Evaluation of Damage Sustained by SK-5, Serial No. 03, Which Sank in Lake Huron", Bell Aerospace Co., RPT-7500-927047, ASDB 10-U04476LM, Aug. 1972.

BAT OCT 72 — "Jeff(B) R/C Model (B-23): Initial Phase of Testing (Phase I)", by P.G. Wright, ASDB 10-U03862LM, Oct. 1972.

BAT OCT 72 — "Habitability Tests of the B-17A Model of the Jeff(B)", by G. Cadelli, Bell Aerospace Co., ASDB 10-U03872LM, Oct. 1972.

BAT OCT 72	"Analysis of the B-17A Model Hydrodynamic Stability Data Obtained at Lockheed and NSRDC Towing Tanks", by G. Cadelli, Bell Aerospace Co., ASDB 10-U07692M, Oct. 1972. Remarks: This report summarizes the cushion-borne stability data for the B-17A model of JEFF(B) tests at NSRDC and compares this data to the Lockheed data.
BAT FEB 73	"Maneuvering and Control, Arctic Surface Effect Vehicle Program, Vol.5", Bell Aerospace Co., RPR-7416-950001, ASDB 10-U04500LM, (AD916172), Feb. 1973. Remarks: Report presents the maneuvering and control section of ASEV study by Boeing.
BAT FEB 73	"Vehicle Dynamics-Arctic SEV Program Final Report, Vol.4", Bell Aerospace Co., RPT-7416-950001, ASDB 10-U04531LM, (AD915282L), Feb. 1973. Remarks: Report presents the results of the vehicle dynamics studies of the ASEV by Bell Aerospace.
BAT FEB 73	"Summary-Arctic SEV Program Final Report, Vol. 11,"Bell Aerospace Co., RPT-7416-950001, ASDB 10-U04509LM, (AD916000L), Feb. 1973. Remarks: Report summarizes the work conducted by Bell Aerospace Co. for Arctic SEV program.
BAT FEB 73	"Model Tests-Arctic SEV Program- Final Report - Vol. 10 and Appendix", RPT 7415-950001, ASDB 10-U04526LM, (AD915802L), Feb. 1973. Remarks: Report presents model test data from the Bell ASEV Model Test Program including performance and vehicle dynamics. Ad # of Appendix is AD915803L).
BAT APR 74	"ARPA Arctic Surface Effect Vehicle Program 150-Ton ASEV Baseline Configuration Studies - Progress Report No. 2", by H.K. Hite, Bell Aerospace Co., ASDB 10-U05389LM, Apr. 1974. Remarks: See DB/NO 10-U05247L for Prg RPT No. 1.
BAT JULY 74	"Arctic Surface Effect Vehicle Program Baseline Configuration 1/16 Scale Model Test Report," Bell Aerospace Co., RPT 7416-928001 (draft), ASDB 10-U07571LF, July 1974. Remarks: Comprehensive description of B-23 model tests at BACNOO with results and conclusions.
BAT 31 JAN 77	"Advanced Naval Vehicles Concepts Evaluation Point Design for 3000-Ton Air Cushion Vehicle,"Bell Aerospace Co., RPT-7588-950049, Jan. 31, 1977.
BAT 31 JAN 77	"Study of Large ACV Skirt Design Concepts," Bell Aerospace Textron, RPT 7588-950048, Jan. 31, 1977.

BAT DEC 77 — "Summary Report, Vol II, AALC JEFF(B) Summary Detail Design and Construction Report", Bell Aerospace, RPT 7385-950008, Dec. 1977.

BAT 77 — "Lesson Plan VI-4, Craft Stability, Control and Maneuvering", by F. Nielan, Bell Aerospace Co. Lecture Notes, 1977.

BAT 14 MAR 78 — "AALC JEFF(B) Safety Gross Hazard Analysis, Part II," Bell Aerospace, RPT 7385-927023, March 14, 1978.

BERTIN 19 MAY 67 — "French Air Cushion Vehicle Developments", by J. Bertin, Canadian Aeronautics and Space Journal, Vol. 14, p. 1-12. Canadian Aeronautics and Space Inst., Air Cushion Vehicles Symposium, Toronto, Canada, May 19, 1967. Remarks: French air cushion vehicle with flexible skirts, discussing funtions and technology.

BERTIN SEPT 70 — "French Marine Air Cushion Vehilces", by J. Bertin, Aeronautical Journal; Royal Aeronautical Society, V74, N717, Sept. 1970, pp 726-735.

BERTRAND DEC 67 — "Handling the SR-N6", by J.J. Bertrand, Hovercraft World, Vol. 1, Dec. 1967, p. 152-153.

BHC NOV 66 — "Summary of SR. N5 Model Test Results", British Hovercraft Corp. RPT-33, ASDB 10-U03250LM, Nov. 1966.

BHC MAY 74 — "Hovercraft Skirts", by Wheeler, R.L., British Hovercraft Corp., May 1974, publ. by Kalerghi Publ. London, England, 1974.

BHC JUNE 74 — "Hovercraft Safety Study: Analysis of Towing Tank Model Tests to Derive Important Design Parameters", British Hovercraft Corp., Dynamics RPT D/R/27, June 1974.

BHC APR 75 — "Hovercraft Comparative Motion Trial", by J.C. Lewthwaite and B.J. Russell, ASDB 10-U09062, Apr. 1975. Remarks: This report presents the results of habitability/craft motion trials conducted on the BH.7 Hovercraft during March, 1975.

BHC JULY 75 — "Comparative Motion Trial with SRN4", British Hovercraft Corp., ASDB 10-U09069, July 1975. Remarks: SRN4 & BH7 motion comparisons; BH7 handling & ride characteristics.

BHC MAR 73 — "Model Tests to Investigate the Safety of the H.D.2 ACV in the Yawed Condition", by B.G. Clarke, British Hovercraft Corporation Ltd., Report No. X/O/1682 for U.K. Ministry of Defence, Department of Trade and Industry, Contract K/A72c/245/CB/A72c, March 1973.

BHC 20 SEPT 76	"Recent United Kingdom Hovercraft Development", by R.L. Wheeler, British Hovercraft Corp., American Institute of Aeronautics and Astronautics and Society of Naval Architects and Marine Engineers, Advanced Marine Vehicles Conference, Arlington, VA., Sept. 20-22 1976, AIAA Paper No. 76-863.
BHC JAN 77	"1000 Ton Air-Propelled Amphibious Hovercraft Study," by D.J. Lloyd and M.D. Mant, British Hovercraft Corp., SP 3837, Jan. 1977.
BHC 68	"Hovercraft Design and Construction", by A.J. Devereux, G.H. Elsley, British Hovercraft Corp., Cornell Maritime Press, Inc., Cambridge, Md. Remarks: Book on hovercraft design and construction covering aerostatic and aerodynamic craft, cushion performance ducting, fans, compressors, drag, propulsion, control, stability, economics.
BHC	"Hovercraft", by R. Stanton-Jones, British Hovercraft Corp., Aeronautical Journal, Vol. 72, p. 911-914. Remarks: Hovercraft and applications of air cushion principle, discussing large and small size vehicles, autostabilization, hybrids and ram wings.
BILES NOV 77	"The Evolution of Safety Requirements for Dynamically Supported Craft", by J.M. Cox, J.H. Biles and Co., Ltd., London, England, Hovering Craft and Hydrofoil, Vol.17, Nov.1977,pp27-36; discussion, p. 37; author's reply, p. 37.
BLA MAR 78	"State of the Art Review of ACV Stability and of the Stability of Other High Performance Ships With Particular Reference to Stability in the Cushionborne or Dynamically Supported Mode", Band, Lavis and Associates, Inc., March 1978. BLA Working Paper 103-5 for NAVSEC.
BLUSTON NOV 65	"Lateral Stability of Ground Effect Machines", by H.S. Bluston, International Shipbuilding Progress, Vol.12, Nov. 1965, pp445-455.
BOEING JUNE 72	"Arctic SEV Program-Quarterly Technical Report", Boeing Co., D180-15007-1, June 1972. Remarks: I Parametric Design; II Skirt Systems; III Vehicle Dynamics; IV Maneuvering and Control. ASDB 10-U04228LF.
BOEING SEPT 72	"Arctic SEV Program-Second Quarterly Technical Report", Boeing Co., D181-15128-1, ASDB 10-U04409LM, Sept. 1972. Remarks: I Parametric Design; II Skirt Systems; III Vehicle Dynamics; IV Maneuvering and Control.

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"Arctic SEV Program-Third Quarterly Technical Report", Boeing Co., D180-15256-1, ASDB 10-U04460LF, Dec. 1972. Remarks: I Parametric Design; II Skirt Systems: III Vehicle Dynamics; IV Maneuvering and Control.

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"Arctic SEV Program- Final Report", Boeing Co., D180-15356-1, ASDB 10-U04505LF, (AD909924), Apr. 1973. Remarks: I Parametric Design; II Skirt Systems; III Vehicle Dynamics; IV Maneuvering and Control.

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"Arctic SEV Configuration Study 500 Ton-Fol.3-Model Test Program", Boeing Co., D180-18139-3, ASDB 10-U05420LF, (AD023046L), Aug. 1974, Final Draft.

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"Arctic SEV Configuraiton Study, 500-ton-Vol.2-Configuration Development", Boeing Co., D180-18139-2, ASDB 10-U05419LM, (AD923045),Aug. 1974.

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OCT 68

"The Dependence of SES Heave Response on Model Scaling Parameters as Deduced from a Simplified Linear Analysis", by J. Breslin, SEV Summer Study Report for Institute of Defense Analysis, Oct. 1968.

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23 APR 70

"A Means of Providing Neutral or Positive Stability for Hovercraft for All Wind Directions", by J.W. Flower, Bristol, University, England, Hovering Craft and Hydrofoil, Vol.9, p. 15-19. Production Engineering Research Establishment, Symposium on Fibre Technology, Melton Mowbray, England, Apr. 23, 1970.

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APR 66

"Stability of Ground Effect Machines", by David I.G. Jones and Margaret Blake, British Aircraft Corp., Ltd., Journal of Aircraft Vol. 3, Mar.-Apr. 1966, p. 118-124.

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"Provisional British Civil Air-Cushion Vehicle Safety Requirements Sections A and B", British Air Registration Board, Feb. 1962. (Report No. unknown). See also "British Hovercraft Safety Requirements" published by the Civil Aviation Authority, 16 November 1972, or later issues.

BRUNEL U.
OCT 74

"A Nonlinear Theory for a Hovercraft Moving Over Regular Waves", by A. J. Reynolds, Brunel University, Journal of Mechanical Engineering Science, Vol. 16, Oct. 1974, pp 10-316.

BRUNEL U.
FEB 77

"Roles of Skirt Planform and Deflection in Hovercraft Response", by A. J. Reynolds, B.E. Brooks, Brunel Univ. Engl.,Journal of Mech. Eng. Sci. vol. 19, n 1, Geb 1977, pp 1-12.

BRUSSELS U.	"Study of Buffeting Motion of Air Cushion Vehicles", by G. Vandesteen, G. Brussels Univ., Belgium 1973. Available NTIS No. N73-32933 (for translation No. N74-10038). Remarks: Aerothermodynamic study of air cushion vehicles buffeting noting dynamical stability, nonlinear behavior, and similitude law.
BRUSSELS U.	"An Experimental Air-cushion Vehicle PV-1 Summary Report", by A.L. Jaumotte, A. Kiedrzynski, M. Lejeune, Brussels Univ., Belgium. Avail. NTIS (Report No. unknown). Remarks: Aerodynamics, stability, and propulsion of ground effect machine, air cushion vehicle PV-1, with and without flaps.
BUCKLE JAN 73	"Technical and Economic Views on ACV's", by A.K. Buckle, Hovering Craft and Hydrofoil, Kalerghi Publications, England, V13 N4, Jan 1973, pp 6-11.
BURGESS APR 63	"Hovercraft Stability Research at the University of Southhampton" by A.J. Burgess, Hovering Craft and Hydrofoil, Vol.2, Apr. 1963, pp 6, 8-9.
BURGESS SEPT 72	"Performance-Cold Weather Tirals, BH-7," by A. J. Burgess, ASDB 10-U04566LF, Sept. 1972. Remarks: See 10-U04565L through 10-U04569L for other reports in this series. Interservice Hovercraft Unit.
BURGESS MAY 74	"Design of Open Loop Segmented Skirts", by A.J. Burgess, Int. Hovering Craft, Hydrofoil and Adv Transit Syst. Conf. Brighton, Sussex, Engl., May 13-16, 1974, pp 69-78. Publ by Karlerghi Publ. London, Engl. 1974.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
CAA, JUN, 75	A	A	A	A	A	A	A	A	A
CALIF U, JUL, 71	-	-	-	-	-	C	-	-	-
" " DEC, 75	-	-	-	-	-	C	-	-	-
CARRIER, SEPT, 76	-	-	C	-	C	-	-	-	-
" APR, 78	-	-	C	C	C	C	-	-	-
CARMICHAEL, 61	-	-	C	-	-	-	-	-	-
" 62	-	-	C	-	-	-	-	-	-
CARNEGIE-MELLON U AUG, 70	B	B	-	-	B	B	-	-	-
CASI, JAN, 76	C	C	C	C	C	C	-	C	C
CHAPLIN, 62	-	-	-	-	-	C	-	-	-
CHALMERS, 68	-	-	C	C	C	C	-	C	-
CIT, AUG, 69	-	-	C	C	C	C	-	-	-
" AUG, 71	-	-	C	-	C	-	-	-	-
" AUG, 71	-	-	B	-	B	-	-	-	-
" NOV, 75	-	C	-	C	-	C	-	-	-
COCKERELL, FEB, 64	-	-	-	-	-	-	-	B	-
COLQUHOUN, FEB, 74	B	B	-	-	-	-	-	-	C
CORNELL, MAY, 74	-	-	-	-	B	B	-	-	-
CRAGO -	-	B	A	A	B	B	-	-	-
CRREL, DEC, 76	C	C	-	-	-	-	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

CAA JUNE 75	"Report of the ARB Special Committee on Hovercraft Stability and Control", Civil Aviation Authority, CAA Paper 75017, ASDB 10-U06986M, June 1975. Remarks: Investigates capsizes causes and recommends design and operation changes.
CALIFORNIA U. JUL 71	"Simulation of Nonlinear Air Cushion Vehicle Dynamics Using Bond Graph Techniques", by C.J. Radcliffe, D. Karnopp, California Univ., Davis, Calif., Computer Simulation Conf. Boston. Mass. July 19-21, 1971.
CALIFORNIA U. DEC 75	"Heave Mode Dynamics of a Tracked Air Cushion Vehicle with Semi-Active Airbag Secondary Suspension", by D.L. Margolis, D. Hrovat, J.L. Tylee, California Univ., American Soc. of Mech. Engineers, Winter Annual Meeting, Houston, Tx., Nov 30-Dec. 4, 1975, 9 p.
CARRIER SEPT 76	"The Effect of Skirt Configuration on the Seakeeping of Air Cushion Vehicles"(SNAME/AIAA), Paper No. 76-864 by Carrier, Lundblad, and Swift, SY Sep. 1976.
CARRIER APR 78	"Seakeeping Dynamics of a Single Cushion, Peripheral Cell-Stabilized Air Cushion Vehicle",J. of Hydronautics, Vol. 12, by R. Carrier, A.H. Magnuson, M. R. Swift, April 1978.
CARMICHAEL 61	"Overland Air Cushion Vehicle Stability and Control Wind Tunnel Experiments", by B.H. Carmichael, D.E. McNay, Ford Motor Co. Publ. U-1447, (AD-286 318), US Army Transportation Research command, 1961.
CARMICHAEL 62	"Stability and Control Experiments on Annular Jet Models of Rectangular Planform over a Large Range of Height and Speed" by B.H. Carmichael, D.E. McNay, Institute of Aerospace Sciences, 1962, Paper 62-139.
CARNEGIE-MELLON U. AUG 70	"The Use of Foam in the Emergency Support of Hovercraft During Power Failure at Sea, Final Report", by T.E. Stelson, Carnegie-Mellon Univ. Avail. NTIS AD717676 Aug. 70. Remarks: Stability, foam, flow, and wave effects on hovercraft during power failure.
CASI JAN 76	"Proceedings of the 10th Canadian Symposium on Air Cushion Technology", Canadian Aeronautics and Space Inst., Montreal (Quebec) Jan. 1976. Technical Report No. 2/77. Avail. National Research Council of Canada. 185 p HC A09/MF A01 Avail. NTIS (N77-24012).

CHAPLIN 62 — "The Control of Ground Effect Machines", by J.B. Chaplin, Institute of Aerospace Sciences, New York. 1962. SMF Fund Paper FF-32.

CHALMERS 68 — "On the Dynamic Stability of an Annular Jet Hovercraft in Heave and Pitch at Zero Speed", by G. Dyne, Chalmers University of Tech. Gothenburg, 1968. Report 41, Dept. of Naval Architecture and Marine Eng. Division of Ship Hydromechanics.

CIT AUG 69 — "The Heave Stability of an Air Cushion Vehicle with a Flexible Peripheral Skirt", by J. Spillman, College of Aeronautics, Cranfield. Aug. 1969. Avail. NTIS No. N70-17959.

CIT AUG 71 — "Stability of Ground Effect Wings: A Preliminary Survey of Theoretical and Experimental Techniques", by P.E. Kumar, College of Aeronautics, Cranfield, England, May 1976, 25 p refs.

CIT AUG 71 — "Effect of Lift-System Airflow on the Hull Aerodynamics of Hovercraft", by E.J. Andrews, Cranfield Institute of Technology, Aug. 1971. ASDB 10-U09392. Remarks: Results of Tests aimed at better understanding of the influence of aerodynamic characteristics on the Handling Qualities of Amphibious Hovercraft.

CIT NOV 75 — "Application of the Cranfield Whirling Arm to the Examination of Hovercraft Cushion Dynamics", by R.J. Cox, Cranfield Institute of Technology, ASDB 10-U07001M, Nov. 1975. Remarks: (Provisional) See DB/NO 10-U07002.

COCKERELL FEB 64 — "Classification of Hovercraft", by C.S. Cockerell, Air Cushion Vehicles (Suppl. to Flight) vol. 4, Feb. 1964, pp 19-20.

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CORNELL MAY 74 — "Vehicle Dynamics of the ASEV", by S.F. Shen, Cornell Univ., ASDB 10-U05283LM, May 1974. Remarks: Critique of ASEV Program vehicle dynamics analyses.

AD-A083 568 BAND LAVIS AND ASSOCIATES INC SEVERNA PARK MD F/G 13/10
BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY --ETC(U)
APR 79 D R LAVIS, E G BAND, A W FOWLER DOT-CG-806510-A
UNCLASSIFIED 117-2 USCG -D-75-79 NL

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AD A083568

CRAGO 68	"Problems Associated with the Use of Skirts on Hovercraft", Proceedings Institute of Mechanical Engineers, Vol. 82, Part 2A (1967-68), by W.A. Crago.
CRREL DEC 76	"Air Cushion Vehicle Ground Contact Directional Control Devices", by Gunars Abele and Ronald A. Liston, Cold Regions Research and Engineering Lab, Nanover, NH, CRREL-SR-76-45, Special Report, Dec. 1976.

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DALEY, AUG, 66	-	C	-	-	-	-	-	-	C
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DSI, MAY, 72	-	-	-	C	-	C	-	-	-
DTC, JAN, 73	-	-	B	-	-	-	-	-	-
DOT, FEB, 75	-	C	-	-	-	-	-	-	C
DTNSRDC, MAY, 65	-	-	-	-	C	-	-	-	-
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DTNSRDC, JULY, 66	-	-	-	-	-	C	-	-	-
" -	-	-	-	C	-	C	-	-	-
" FEB, 67	-	-	-	-	C	C	-	-	-
" MAY, 67	-	-	-	-	-	C	-	-	-
" NOV, 68	C	C	-	-	-	-	-	-	-
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" FEB, 70	-	-	-	B	-	-	-	-	-
" FEB, 70	-	-	-	B	-	-	-	-	-
" MAY, 70	-	-	-	B	-	-	-	-	-
" NOV, 70	-	-	-	-	-	B	-	-	-

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DTNSRDC, FEB, 71	-	-	-	B	-	-	-	-	-
" FEB, 71	-	-	-	B	-	-	-	-	-
" JUNE, 71	C	C	-	-	-	-	-	-	-
" AUG, 71	C	C	-	-	-	-	-	-	-
" JAN, 72	-	B	-	-	-	-	-	-	-
DTNSRDC, MAR, 72	B	-	-	-	B	-	A	B	C
" MAR, 72	C	-	-	-	-	-	-	-	-
" APR, 72	-	B	-	-	-	-	-	-	-
" JUNE, 72	-	-	-	-	-	B	-	-	-
" AUG, 72	-	-	B	A	-	-	-	A	B
DTNSRDC, AUG, 72	-	-	-	-	-	B	-	B	B
" AUG, 72	-	-	B	A	-	-	-	A	B
" AUG, 72	-	B	-	-	-	B	-	-	-
" DEC, 72	-	-	-	C	-	C	-	-	-
" FEB, 73	-	B	-	-	-	-	-	-	-
DTNSRDC, MAR, 73	-	-	-	B	-	-	-	-	-
" MAR, 73	-	-	-	B	-	-	-	-	-
" MAR, 73	-	B	-	-	-	B	-	-	-
" MAR, 73	-	B	-	-	-	B	-	-	-
" MAR, 73	-	B	-	-	-	B	-	B	B

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DTNSRDC, APR, 73	-	-	-	-	-	C	-	-	-
" APR, 73	-	B	-	-	-	-	-	-	B
" MAY, 73	-	C	-	-	-	-	-	-	-
" AUG, 73	-	-	-	-	-	C	-	-	-
" OCT, 73	-	-	-	-	-	C	-	-	-
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" JAN, 74	-	-	-	B	-	-	-	-	-
" JAN, 74	-	-	-	B	-	-	-	-	-
" APR, 74	-	-	-	B	-	-	-	-	-
" APR. 74	-	-	-	-	-	-	-	-	B
DTNSRDC, MAY, 74	-	-	-	B	-	-	-	-	-
" MAY, 74	-	-	-	B	-	-	-	-	-
" NOV, 74	-	-	-	-	-	C	-	-	-
" DEC, 74	-	-	-	C	-	-	-	-	-
" JUNE, 75	-	-	-	C	-	-	-	-	-
DTNSRDC, JUNE, 75	-	C	-	C	-	C	-	-	-
JUNE, 75	-	-	-	C	-	-	-	-	-
AUG, 75	-	-	B	B	B	B	-	B	B
AUG, 75	-	B	-	-	-	-	-	-	B
SEPT, 75	B	B	B	B	B	C	-	C	C

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DTNSRDC, NOV, 75	-	-	-	-	-	C	-	-	-
" NOV, 75	-	-	B	B	-	-	-	-	-
" 75	-	B	-	-	-	-	-	-	-
" APR, 76	-	-	-	C	-	C	-	-	-
" JUNE, 76	-	-	-	-	-	B	-	-	-
DTNSRDC, JUNE, 76	-	-	B	-	-	-	-	-	-
" JUNE, 76	-	C	-	-	-	C	-	-	-
" JUNE, 76	C	C	B	B	B	B	-	C	-
" 20 SEPT, 76	-	-	-	B	-	-	-	-	-
" OCT, 76	-	-	C	B	-	-	-	-	-
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" JAN, 77	-	-	-	B	-	-	-	-	-
" 22 MAR, 77	-	-	-	-	B	-	-	-	-
" APR, 77	-	-	-	B	-	-	-	-	-
" MAY, 77	-	-	-	B	C	-	-	-	-
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" MAY, 77	-	-	-	C	-	-	-	-	-
" - 79	B	-	A	A	B	B	-	B	-
" AUG, 61	C	-	-	-	-	-	-	C	-
DUKE U., NOV, 72	-	-	-	-	-	B	-	-	-
DYNE, OCT, 68	-	-	-	-	-	B		-	-

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DAEDALEAN SEPT 74	"Linearized Air Cushion Dynamics for Large Surface Effect Vehicles", by R.K. Muench, Daedalean Associates, Inc., ASDB 10-U05454L, Sept. 1974.
DALEY AUG 66	"U.S. Navy Tests of SKMR-1 in an Operational Environment", by R.F. Daley and J.U. Kordenbrock, AIAA-66-729, ASDB- 10-U03299M, Aug. 1966.
DOCTORS 72	"Forces on an Air-Cushion Vehicle Executing an Unsteady Motion", by L.J. Doctors, Symposium on Naval Hydrodynamics (9th), ASDB 10-U05630M, 1972.
DRT JAN 72	"Examining Some Design Parameters for Arctic SEV by Means of Airborne Laser Profilimetry", by L.A. Leshack, J.B. Long, ASDB 10-U04161, Development and Resources Transportation Co., Jan. 1972.
DSI MAY 72	"Experimental Study of SEV Skirt Drag", Developmental Sciences, Inc., ASDB 10-U07364LM, May 1972. Remarks: Proposed model studies with scaled cushion pressure.
DTC JAN 73	"Cushion Air System Parametric Assessment Rig (CASPAR) Program", Draft Appendix, Department of Transport, Canada, ASDB 10-U07700M, Jan. 1973. Remarks: Intended study of ACV cushion systems.
DOT FEB 75	"Operation of Hovercraft in the New York City Metropolitan Area; Volume I, A Technical Evaluation", Department of Transportation, ASDB 10-U06494, DOT-TST-75-86, Feb. 1975. Remarks: Also see data bank #10-U06495.
DTNSRDC AUG 61	"Results of GEM III Tethered Tests", by A.E. Johnson and H.R. Chaplin, RPT-1546, DTNSRDC, ASDB 10-U09500. Remarks: Static test results on hovering performance, pitch and roll stability, and control effectiveness are presented.
DTNSRDC SEPT 64	"Pitch Stability and Air Flow Studies on the SKMR-2 Dynamic Model", DTNSRDC Test Report 013-H-01, A. Gersten, Sept. 1964.
DTNSRDC MAY 65	"Elementary Fluid Dynamic Design Principles of Ground Effect Machines: Section H-General Performance Summary", by H. Chaplin and A. Ford, DTNSRDC, ASDB 10-U05232M, May 1965. Remarks: See 10-U03655 through 10-U03659, and 10-U05231 for others in this series.

DTNSRDC 65	"Seaworthiness Characteristics of a Ground Effect Machine Obtained from Model Tests over Regular Waves: Final Report", by A. Gersten and J.M. Sheehan, DTNSRDC, DTMB RPT 2034 (AD 627 250), 1965.
DTNSRDC JULY 66	"Some Design Principles of Ground Effect Machines, Section G-Seakeeping", by H.R. Chaplin and A.G. Ford, ASDB 10-U03659F, AD640015, RPT-2121G, DTNSRDC, July 1966.
DTNSRDC FEB 67	"Some Design Principles of Ground Effect Machines, Section F-Cushion Contributions to Stability", by H.R. Chaplin and Allen G. Ford, DTNSRDC, Feb. 1967, 40 p, DTMB RPT No. 2121F.
DTNSRDC MAY 67	"Wave Pumping and Its Effects on the Design and Operation of Air-Cushion Ships", by M.W. Beardsley, DTNSRDC, ASDB 10-U03035F, (AD650669), Mar. 1967.
DTNSRDC NOV 68	"Comments on the VT-1 Air Cushion Vehicle", by A.G. Ford, DTNSRDC ASDB 10-U04634M, Nov. 1968.
DTNSRDC OCT 69	"Circular of Requirements for an ACV Amphibious Assault Landing Craft (C150-50)", AALC Program Office, October 1969.
DTNSRDC FEB 70	"Seaworthiness Characteristics of a 320,000 Pound Air Cushion Vehicle Obtained from Model Tests in Random Waves, Part II", (Bell Aerosystems Company Design, by A. Gertsen, DTNSRDC, ASDB 10-U03043LM, Feb. 1970.
DTNSRDC FEB 70	"Seaworthiness Characteristics of a 320,000 Pound Air Cushion Vehicle Obtained from Model Tests in Random Waves, Part I", Aerojet-General Corp. Design, by A. Gersten, DTNSRDC, ASDB 10-U03044LM, Feb. 1970.
DTNSRDC MAY 70	"Seaworthiness Characteristics of a 320,000 Pound Air Cushion Vehicle Obtained from Model Tests in Random Following Seas, Part II", Bell Aerosystems Co. Design, by J.A. Kallio and A. Gersten, DTNSRDC, ASDB 10-U03045LM, May 1970.
DTNSRDC NOV 70	"Approach to the Arctic SEV Six-Degree-of-Freedom Computer Simulation", by R.P. Lebeau, H.J. Howe, DTNSRDC, ASDB 10-U04026, Nov. 1970.
DTNSRDC FEB 71	"Seaworthiness Characteristics of a AALC C150-50 Verification Model Part II", Bell Aerospace Co. Design, DTNSRDC, by James A. Kallio, ASDB 10-U03054LM, Feb. 1971.

DTNSRDC FEB 71	"Seaworthiness Characteristics of a AALC C150-50 Verification Model Part I", Aerojet-General Corp. Design, by J.A. Kallio, DTNSRDC, ASDB 10-U03055LM, Feb. 1971.
DTNSRDC JUNE 71	"Detailed Plans for the Arctic SK-5 Trials", ASEVPO, DTNSRDC, ASDB 10-U04020L, June 1971.
DTNSRDC AUG 71	"Overview of SK-5 Barrow, Alaska Tests", ASEVPO, DTNSRDC, ASDB 10-U04079L, Aug. 1971.
DTNSRDC JAN 72	"Preliminary Results of Tests of a 10-Ton Surface Effect Vehicle in the Arctic-Discrete Obstacle Crossing", by H.J. Howe and J.M. Durkin, DTNSRDC 10-U04162L, Jan. 1972.
DTNSRDC MAR 72	"Sinking of SK-5 (ACV-3) Lake Huron, Michigan-Arctic Surface Effect Vehicle Program", by R.H. Putnam, ASEVPO, DTNSRDC, ASDB 10-U04208LM, Mar.1972.
DTNSRDC MAR 72	"Report of Efforts to Recover Surface Effect Vehicle, SK-5 Ser.No. 03, from Lake Huron During November and December 1971", by R.H. Putnam, ASEVPO, DTNSRDC, ASDB 10-U04209LM, Mar. 1972.
DTNSRDC APR 72	"Preliminary Results of Tests of a 10-Ton Surface Effect Vehicle in the Arctic-Pilot Induced Oscillation", H.S. Ozarko, DTNSRDC ASDB 10-U04202LM, (AD901496L), Apr 1972.
DTNSRDC JUNE 72	"Numerical Method to Determine the Six-Degree-of-Freedom Motion of a Surface Effect Vehicle Part II USER Notes", by J. M. Durkin, DTNSRDC, ASDB 10-u04514LM, June 1972.
DTNSRDC AUG 72	"Intact and Damaged Stability Behavior of the JEFF(B) Design of an AALC Air Cushion Vehicle in a Sea State 5", by R.E. Conrad, DTNSRDC, ASDB 10-U03245LM, Aug. 1972.
DTNSRDC AUG 72	"Survivability of an Afloat Amphibious Surface Effect Vehicle (SEV)", by O.F. Hackett, F.J. Danforth, DTNSRDC, ASDB 10-U03281LF, Aug. 1972.
DTNSRDC AUG 72	"Intact and Damaged Stability Behavior of the JEFF(A) Design of an AALC Air Cushion Vehicle in a Sea State 5", by R.E. Conrad, DTNSRDC, ASDB 10-U03295LM, Aug. 1972.

DTNSRDC AUG 72	"10-Ton SEV Obstacle-Crossing Data Related to Cushion System Dynamics", by S.R. Shank, Jr. and J.S. Houston, DTNSRDC, ASDB 10-U04192LF, (AD902862), Aug. 1972.
DTNSRDC DEC 72	"Surface Effect Vehicle Hovering/Heaving Characteristics-Inviscid Peripheral Jet Model", T. Keith and J. Houston, DTNSRDC ASDB 10-U04131LM, (AD905671L), Dec. 1972.
DTNSRDC FEB 73	"Compilation of Motion Data Obtained on Voyager ACV During OSDOC II Exercise in October, 1972", by R.D. Pierce, DTNSRDC ASDB 10-U03826LM, Preliminary Report, Feb. 1973.
DTNSRDC MAR 73	"Horizontal Plane Static and Dynamic Stability Charcteristics of the JEFF(A) Amphibious Assault Landing Craft", by J.A. Fein, DTNSRDC ASDB 10-U03401LM, Mar. 1973.
DTNSRDC MAR 73	"Horzontal Plane Static and Dynamic Stability Characteristics of the JEFF(B) Amphibious Assault Landing Craft", by J.A. Fein, DTNSRDC ASDB 10-U03913LM, Mar. 1973.
DTNSRDC MAR 73	"Analysis of Discrete Obstacle Crossing Data from Trials of a 10-ton Surface Effect Vehicle in the Arctic-Part II", by H.J. Howe, DTNSRDC ASDB 10-U04623L, Mar. 1973.
DTNSRDC MAR 73	"Analysis of Discrete Obstacle Crossing Data from Tirals of a 10-Ton Surface Effect Vehicle in the Arctic-Part I", by H.J. Howe, DTNSRDC ASDB 10-U05392LM, Mar. 1973.
DTNSRDC MAR 73	"Progress Report on Ambulance Craft and Casualty Perceiving Ship Environments", by W.E. Carr and K.W. Goben, DTNSRDC, ASDB 10-U09225, Mar. 1973. Remarks: This document compares several vehicles which may be used for casualty removal operation vs. environment and motions.
DTNSRDC APR 73	"Investigation of the Relative and Absolute Ship Motions of Ships Involved in the 'Offshore Discharge of Containership' Sea Trials", by S.R. Gunderson and L.C. Ruth, DTNSRDC, ASDB 10-U03951LM, Apr. 1973.
DTNSRDC APR 73	"SRN-4 Data", DTNSRDC, ASDB 10-U09242, Apr. 1973. Remarks: This report presents data which were taken on a SRN-4 class hovercraft during regularly scheduled ferry operation across the English Channel.

DTNSRDC MAY 73	"1971 Arctic Trials of a 10-Ton Surface Effect Vehicle", by J.J. Shabiski and R. Purnam, DTNSRDC, 4100, May 1973.
DTNSRDC AUG 73	"Air Cushion Vehicles New Technology in the Navy", by Z.G. Wachnik, RPT-4141, DTNSRDC ASDB 10-U02832M, (AD773350), Aug. 1973. Remarks: Describes status and accomplishments of AALC technology program-make recommendations for additional work.
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DTNSRDC NOV 75	"Prediction of the Motion of the JEFF(B) Amphibious Assault Landing Craft in Head Seas", by A.H. Magnuson and R.R. Messale, DTNSRDC, ASDB 10-U07654LM, Nov. 1975. Remarks: A computer simulation of the rigid-body motion of the JEFF(B) AALC in head seas operation is presented.
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DTNSRDC JUNE 76	"Overland Vertical Plane Motion Prediction for an Air-Cushion-Supported Vehicle: Initial Verification of Inertial and Damping Characteristics", by David D. Moran, DTNSRDC. Report SPD 615-03, June 1976 .
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EAMES, 61	-	-	-	-	C	C	-	-	-
EEAL, 61	-	-	C	-	-	-	-	-	-
EEAL, 61	-	-	-	-	C	-	-	-	-

A = 1st Class Material, Important to Program

B = Supporting Material

C = Useful but Nonessential to Program

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FEIN, 25 FEB, 74	-	-	-	C	-	C	-	-	C
FHC, OCT, 64	-	B	-	-	-	-	-	-	B
FHC, MAY, 65	-	B	-	-	-	-	-	-	-
FML, 62	-	C	-	-	-	-	-	-	-
FRESH, JUN, 60	-	-	-	C	-	-	-	-	-
FROST, SEPT, 63	-	-	-	-	-	C	-	C	-

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GRUMMAN, 62	-	-	C	-	-	-	-	-	-
" OCT, 70	-	C	-	-	-	-	-	-	-
" SEPT, 72	-	-	-	-	C	C	-	-	-
GARDNER, DEC 66-JAN 67	-	-	-	-	-	-	-	A	B
GCAM, NOV, 60	-	-	-	-	-	C	-	-	-
GD, 60	-	-	-	-	-	C	-	C	-
" -	-	-	-	C	-	C	-	-	-
" OCT, 61	-	-	-	-	-	C	-	-	-
" 66	-	C	-	-	-	-	-	-	-
" OCT, 66	-	C	-	-	-	C	-	-	-
GD, JULY, 65	-	-	-	-	-	C	-	-	-
" 66	C	C	-	-	-	-	-	-	-
" JUNE, 70	-	-	C	C	-	-	-	-	-
" OCT, 76	-	-	-	-	C	C	-	-	-
GEORGE, AUG, 63	C	C	-	-	-	-	-	-	-
GIRAUD, SEPT, 66	C	C	-	-	-	-	-	-	-
GUIENNE, -	C	B	-	-	-	-	-	-	-

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HABERCOM, FEB, 75	C	C	C	C	C	C	-	-	C
" JUNE, 76	C	C	C	C	C	C	-	-	C
" JUNE, 76	C	C	C	C	C	C	-	-	C
HAMMIT, 73	B	-	-	-	B	-	-	-	-
HARDWICK, OCT, 62	-	C	-	-	-	-	-	B	-
HAUSSLING, JUNE, 76	-	-	-	-	-	C	-	-	-
HAWKER, FEB, 72	C	C	-	-	C	C	-	-	-
HDL, 62	-	-	-	-	C	-	-	-	-
HEPWORTH, SEPT, 65	-	-	-	-	-	-	-	C	-
HERROUIN, MAY, 76	C	C	-	-	-	-	-	-	-
HILLER AIR, JUNE, 76	-	-	-	-	C	-	-	-	-
HOVERLLOYD, FEB, 72	B	A	-	-	-	-	-	-	B
HERRO, SEPT, 65	-	B	-	-	-	-	-	C	-
HYDRONAUTICS, 62	C	C	-	-	-	-	-	-	-
" 62	-	-	-	-	-	C	-	-	-
HYDRONAUTICS, 62	-	-	-	-	-	C	-	-	-
" 62	C	C	-	-	-	-	-	-	-
" DEC, 64	-	-	B	-	-	-	-	-	-
" 68	-	-	B	-	-	-	-	-	-
" JAN, 69	-	-	-	B	-	B	-	C	-

A = 1st Class Material, Important to Program

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HYDRONAUTICS, AUG, 70	-	-	-	B	-	-	-	-	-
" AUG, 70	-	-	-	B	-	-	-	-	-

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HABERCOM
FEB 75
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JUNE 76
"Surface Effect Vehicles/Ships in Marine Environments" (Citations from the Engineering Index Data Base), by Guy E. Habercom Jr., NTIS, Rept. for 1972-May 76, June 1976, 119 p.

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HAMMIT
73
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OCT 62
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62
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SEPT 65
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IOWA, U., NOV, 75	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

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IOWA, U.
NOV 75

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JOHNS-MANVILLE, 69	-	C	-	-	C	-	-	-	-

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KANSAS, U, DEC, 65	-	-	C	-	C	-	-	-	-
" NOV, 67	-	-	-	-	C	-	-	-	-
" JUNE,69	-	-	-	-	C	-	-	-	-
" 69	-	-	-	-	C	-	-	-	-
" FEB, 74	-	-	-	-	-	C	-	-	-
KEILLER,AUG-SEPT, 64	-	B	-	-	-	-	-	-	-
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" SEPT, 67	-	C	-	-	-	-	-	-	-
KELLETT AIR, NOV, 73	-	-	-	-	C	-	-	-	-
KIND, JUNE, 72	-	C	-	-	C	-	-	-	-

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LAVIS, JULY, 74	-	-	-	B	B	B	-	-	-
" -	-	-	-	C	C	B	-	B	-
LESTER, 66	C	-	-	-	-	-	-	-	-
LIEBERMAN, DEC, 61	-	-	-	-	-	C	-	-	-
LIN, APR, 63	-	-	-	-	-	C	-	-	-
LINGUISTIC, NOV, 73	-	-	-	-	-	C	-	-	-
LITHERLAND, NOV, 64	-	-	-	-	-	C	-	-	-
LOCKE, DEC, 62	C	C	-	-	-	-	-	-	-
LMSC, APR, 74	-	-	-	-	C	C	-	-	-
LLOYDS, 68	-	-	-	-	-	-	-	B	-
LUHRS, SEPT, 77	-	-	-	-	-	-	-	C	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

LAVIS JULY 74	"On the Acceleration Response of Air Cushion Vehicles to Random Seaways and the Distortion Inherent in Scale Models", by D.R. Lavis et al, Jr. of Hydronautics, Vol.8, No.3, July 1974.
LAVIS	"Surface Effect Vehicles: Principles and Applications", by D.R. Lavis and J. Sladky. To be published, Penssylvania State Press.
LESTER 66	"A Note on Some Static Tests on Flexible Skirts for Hovercraft", by W.G.S. Lester, F.T. Kiernan, Royal Aircraft Establishment, 1966, Technical Note 66053.
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MACK, NOV, 63	C	-	-	-	-	-	-	-	-
MAGNUSON, JAN, 75	-	-	-	-	-	C	-	-	-
MAGUZZU, SEPT, 76	-	C	-	-	-	C	-	-	-
MANTLE, JUNE, 74	C	C	-	-	-	-	-	-	-
" JUNE, 76	C	B	-	-	-	-	-	C	-
MARTIN, JUNE, 76	-	-	-	-	-	-	-	C	-
MARYLAND U, NOV, 62	-	-	-	-	C	-	-	-	-
MASLOV, OCT, 77	-	-	-	-	C	C	-	-	-
MIT, 66	-	-	-	-	-	C	-	-	-
" DEC, 73	-	-	-	C	-	C	-	C	-
MIT DEC, 74	-	-	-	-	-	C	-	-	-
" JULY, 75	-	-	-	-	C	-	-	C	-
MICHIGAN, DEC, 70	-	-	-	-	-	B	-	-	-
MURTHY, JULY, 71	-	-	-	-	-	C	-	-	-
" OCT, 74	-	-	-	-	-	C	-	-	-
MURTHY, NOV, 74	-	-	-	-	-	C	-	-	-

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MACK NOV 63	"Stand Und Tendenzen Der Bodenef-Fektgerate-Entwicklung (The State of the Art and Trends in the Development of Ground Effect Machines)", by K.W. Mack, Luftfahrttechnik Raumfahrttechnik, vol. 9, Nov. 1963, pp. 319-336. (English Translation unavailable for review).
MAGNUSON JAN 75	"Dynamic Performance Characteristics of an Air Cushion Vehicle", by A.H. Magnuson, J.A. Fein, D.D. Moran, Journal of Hydronautics, Vol.9, No. 1, pp.13-24, ASDB 10-U06360M, Jan. 1975. See also AIAA/SNAME paper 74-323.
MAGUZZU SEPT 76	"An Automatic-Control Air-Jet-Propelled ACV", Hovering Craft & Hydrofoil, Vol. 16, No. 2, Nov. 1976.
MANTLE JUNE 74	"Large High-Speed Surface Effect Ship Technology", by P.J. Mantle, Hovering Craft and Hydrofoil, ASDB 10-U05735, June 1974. Remarks: International Hovering Craft, Hydrofoil and Advanced Transit System Conference May 1974, England.
MANTLE JUNE 76	"Cushions and Foils", by P.J. Mantle, SNAME Spring Meeting, June 1976. (Report No. unknown)
MARTIN DEC 65	"The Hovercraft in Law: A Lawyer Examines the Current Situation", by P. Martin, Air Cushion Vehicles (Suppl. to Flight) vol.6, Dec. 1965, pp 85-87.
MARYLAND U. NOV 62	"Experimental Studies of the Aerodynamics of Ground Effect Machines", by D.S. Gross and J.V. Powers, Jr., Maryland University, College Park, Army Transportation Research Command, Nov. 1962, 208 p.
MASLOV OCT 77	"Stability of an Air Cushion Machine in the Presence of a Receiver", by L.A. Maslov and A.G. Panovko, Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela, Sept-Oct. 1977, p. 57-62. In Russian.
MIT 66	"Static and Dynamic Behaviour of a Flexible Base Fluid Suspension", by B.L. Casey, Massachusetts Institute of Technology Engineering Projects Lab., Cambridge, Mass. 1966, DSR-76110-5.

MIT DEC 73	"Linearized Models, Stability Criteria and Experimental Verification for Plenum Air Cushions with Compressor-Duct Interactions Final Report", by L.M. Sweet, H.H. Richardson, and D.N. Wormley, Mass. Inst. of Tech., Cambridge. Dec. 1973. Available as D.O.T. Report DOT-FRA-ORD & D-74-40, May 1974.
MIT DEC 74	"Water, Air and Interface Vehicles", P. Mandel, Mass. Inst. of Tech., ASDB 10-U06467, Dec. 1974.
MIT JULY 75	"Advanced Marine Vehicles (MIT)-SES Technology - Hydrodynamics of the Hull; Response in Waves", by S. Davis, Mass. Inst. of Tech., ASDB 10-U07963M, July 1975. Presented at MIT Professional Summer July 7-11, 1975.
MIT JULY 75	"Advanced Marine Vehilces (MIT)-ACV Overall Sizing & Requirements", by P.J. Mantle, Mass. Inst. of Tech., ASDB 10-U07977M, July 1975.
MICHIGAN DEC 70	"Wave Resistance of an Air Cushion Vehicle in Accelerated Motion", by L.J. Doctors, S.D. Sharma, Univ. of Michigan, ASDB 10-U03051M, (AD716055), Dec. 1970. Remarks: Results are reported of a study of the theoretical wave resistance of ACVS in steady and unsteady motion.
MURTHY JULY 71	"Hovercraft Research at the University of Southampton", by T.K.S. Murthy, Hovering Craft and Hydrofoil, V10, July 71, 5 p. Kalerghi Publications, Inc, London, England.
MURTHY OCT 74	"Eighth Canadian Symposium on Air Cushion Technology, Toronto, Sept. 9-11, 1974", by T.K.S. Murthy, Hovering Craft and Hydrofoil Vol. 14, No. 1, Oct. 1974.
MURTHY NOV 74	"Symposium on Air Cushion Handling Organized by BHRA Fluid Engineering and Held on October 16, 1974 at the Royal Aeronautical Society, London", by T.K.S. Murthy, Hovering Craft and Hydrofoil, vol. 13, No. 2, Nov. 1974.

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NAL, JAPAN, NOV, 74	-	-	-	-	C	C	-	-	-
NASA 67	C	C	-	-	-	-	-	-	-
" 69	-	-	-	-	-	C	-	-	-
" NOV 72	-	-	-	-	-	C	-	-	-
" APR 71	-	-	-	-	-	C	-	-	-
NAVSEC, DEC, 70	C	-	-	-	C	-	-	-	-
" DEC, 73	-	C	-	-	-	C	-	-	-
" OCT, 74	-	C	-	-	-	C	-	-	-
NEW HAMPSHIRE, APR, 78	-	-	-	-	-	C	-	-	-
NISC, 70	-	-	-	-	C	C	-	C	-
NISC, MAY, 75	C	-	-	-	-	-	-	-	-
NPL, JAN, 66	-	-	-	C	-	-	-	-	-
" NOV, 68	-	-	B	-	-	-	-	-	-
" 68	-	-	B	-	B	B	-	-	-
" 69	-	-	-	-	-	B	-	C	-
NPL, 70	-	-	-	-	-	-	-	-	A
" MAR, 68	C	C	C	C	-	-	-	-	-
NPRD, JUNE, 73	-	-	-	-	-	-	-	C	-
" JUNE, 76	-	C	-	-	-	C	-	-	-
NRC, MAR, 68	-	-	C	C	-	-	-	-	-

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NSMB JULY,64	-	-	-	C	-	-	-	-	-
" -	-	-	C	C	-	-	-	-	-
NSW U, APR, 74	-	-	-	-	-	B	-	-	-
NYAS, NOV, 68	-	-	-	-	C	C	-	-	-

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NAL, JAPAN
NOV 74

"A Study on the Dynamic Characteristics of a Peripheral-Jet Air Cushion", by M. Sasaki, National Aerospace Lab., Chofu, Japan, JSME, Bulletin, Vol. 17, Nov. 1974, pp 1438-1446.

NASA
67

"Investigation of the Free Flight Characteristics and Handling Qualities of a Ground Effect Machine", by A.W. Carter and L.H. Person, National Aeronautics and Space Administration, Washington, 1967, NASA-TN-D-3885.

NASA
69

"Heave Response of a Plenum Air Cushion Including Passive and Active Control Concepts", by J.D. Leatherwood, G.V. Dixon, D.G. Stephens, National Aeronautics and Space Administration, Langley Research Center, 1969. NASA-TN-D-5202.

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NOV 72

"Active Air Cushion Control System Minimizing Vertical Cushion Response", by J.D. Leatherwood and D.G. Stephens, NASA, Nov. 1972. Remarks: Design and development of active control system for air cushion vehicle to reduce or eliminate effects of excessive vertical vibratory acceleration.

NASA
APR 71

"Analog Analysis of the Heave Response and Control of a Plenum-Type Air Cushion Vehicle", by J.D. Leatherwood, NASA, Langley Research Center. NASA-TN-D-6257, L-7227 April 1971. Avail. NTIS No. N71-22539. Remarks: Numerical analysis of dynamic and thermodynamic state of plenum-type air-cushion vehicle to determine heave response and control system operating characteristics.

NAVSEC
DEC 70

"Travel Report of Messrs. E.L. Aronne and A.F. Johnson to United Kingdom, Italy, Germany, Norway and Sweden", by E.L. Aronne and A.F. Johnson, NAVSEC, ASDB 10-C00211F, Dec. 1970. Remarks: Report on the status of four MWDDEA's in the general area of high speed craft design and areas of participation in cooperative research and development programs.

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DEC 73

"Slamming of High-Performance Marine Vehicles", by J.G. Giannotti, N. Fuller, NAVSEC, ASDB 10-U09353, RPT 6136-73-32, Dec. 1973. Remarks: A review of slamming theories and their application to high performance vehicles.

NAVSEC
OCT 74

"Performance Characteristics of High Performance and Advance Marine Vehicles", by J. Buck, C.G. Kennell, N.R. Fuller, NAVSEC, ASDB 10-U05696M, Oct. 1974. Remarks: Presented at Chesapeake Section at SNAME On 9 October 1974.

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NISC 70	"Wig Longitudinal Stability Criteria", by R.D. Irodov, Naval Intelligence Support Center, Washington, D.C., English translation. Avail. NTIS (AD A007430).
NISC MAY 75	"The 'Sormovich' Experimental Air Cushion Vehicle", by A. Zhivotovskii, V. Shenberg, A. Minchenya, Naval Intelligence Suport Center, NISC-Trans-3677, May 1975.
NPL JAN 66	"Tests on a Hovercraft Model in Irregular Waves", by J.T. Everest, National Physical Laboratory, England, Ship TM-111, ASDB 10-U05026M, Jan. 1966.
NPL NOV 68	"Experiments on the Skirted Hovercraft Running at Angles of Yaw with Special Attention to Wave Drag", by J.T. Everest, R.C. Willis, National Physical Laboratory Ship Division, 1968.
NPL 68	"Lateral Stability and Control of Hovercraft", by M.J. Barratt, National Physical Lab. Hovercraft Unit, 1968. Hovercraft RPT 3.
NPL 69	"The Mechanism of Skirt Bounce", by M.J. Barratt, National Physical Laboratory Hovercraft Unit, 1969, Hovercraft TM 21.
NPL 70	"The Definition of Sea State for Hovercraft Purposes", National Physical Laboratory Hovercraft Sea State Committee, Hovering Craft and Hydrofoil, vol. 9, Mar. 1970, pp 13-17.
NPL MAR 68	"A Review of Hovercraft Research in Britain", by A. Silverleaf, National Physical Lab., England. UK Hovercraft Research Covering Internal/External Dynamics, Propulsion systems and Full Scale Tests. ASDB 10-U03007, March 1968.
NPRD JUNE 73	"Assessing the Effects of Jeff Craft Motion on Crew Performance", by R.A. Sniffin, Naval Personnel Research and Development, ASDB 10-U02571LM, June 1973.

NPRD JUNE 76	"Preliminary Review of Motion Stabilization Techniques for Consideration in Landing Vehicle Assault Design", by W. J. Stinson, Navy Personnel Research and Development Center, ASDB 10-U08640 , June 1976. Remarks: Describes several methods.
NRC MAR 68	"An Experimental Study on the Dynamic Stability of a Ground Effect Machine Model in Heave, Pitch and Roll", by Van Den Brug, and P. Van Staveren, Netherlands Research Center, REPT-19074/6931/SB, March 1968, ASDB 10-U03105. See also International Ship Building Progress, Vol. 16, Sept. 1969, pp 277-297.
NSMB JULY 64	"Seakeeping Test Report No.157. Tests with a Model of a Ground Effect Machine SKMR I 'Hydroskimmer' Flying Over Regular Seas-Model", by R. Wahab, W.A. Swaan, Netherlands Ship Model Basin, ASDB 10-U09463, July 1964.
NSMB MAY 65	"Behavior of a Ground Effect Machine Over Smooth Water and Over Waves", by W.A. Swaan, R. Wahab, Netherlands Ship Model Basin, ASDB 10-U03005, Hovering Craft & Hydrofoil,Vol.4,May 1965, pp 18-24.
NSW, U. APRIL 74	"Hydrodynamic Influence on the Nonlinear Motion of an Air-Cushion Vehicle Over Waves", by L.J. Doctors, University New South Wales, ASDB 10-U05646., April 1974.
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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
OCEANICS, NOV, 72	-	-	-	-	-	C	-	-	-
" FEB, 74	-	-	-	-	B	B	-	B	-
" FEB, 74	-	-	-	-	-	C	-	-	-
" MAY, 74	-	-	-	-	C	-	-	C	-
" MAY, 74	-	-	-	-	-	C	-	C	-
OCEANICS, MAY, 74	-	-	-	-	C	-	-	-	-
" SEPT, 74	-	B	-	-	-	B	-	-	-
OLMSTEAD, AUG, 74	-	-	-	-	-	C	-	-	-
OZAWA, FEB, 70	-	-	-	C	-	C	-	-	-

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OCEANICS
30 NOV 72
"Arctic Surface Effect Vehicle Program-Vehicle Dynamics Quarterly Technical Report Sept. 1 thru Nov. 30, 1972, RPT-3, Oceanics, Inc., ASDB 10-U04433LM, Nov. 30, 1972.

OCEANICS
FEB 74
"Development of the ASEV Motions Program and the Analysis of Results of Numerical Studies for Selected Craft Configurations", by J. Schneider, P.S. Bono, Oceanics, Inc., ASDB 10-U09118L, RPT-73-101B, Feb. 1974. Remarks: Detailed description of the development fo the arctic SEV motions program. Also presented is the development of stability criteria from the pericell model.

OCEANICS
FEB 74
"Study of the Dynamics of Arctic Surface Effect Vehicles; Part II Development of the ASEV Motions Program and the Analysis of Results of Numerical Studies for Selected Craft Configurations", by J. Schneider, P.S. Bono, Oceanics, Inc., ASDB 10-U05428LM, (AD920398L, Feb. 1974. Remarks: See 10-U04546L for Part I-Development of the Analyses.

OCEANICS
MAY 74
"Surface Effect Ships Aero/Hydrodynamics Technology Design Manual, Volume II, Design Criteria, Range, Drag, and Components", Oceanics, Inc., ASDB 10-U07895LM, (ADB004139), May 1974. Part II of a series of SES Design Manuals; Ref. Vol's I, III, & IV.

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MAY 74
"Surface Effect Ships Aero/Hydrodynamics Technology Design Manual, Volume III, Dynamic Performance", Oceanics, Inc., ASDB 10-U07896LM, (ADB004140), May 1974. Part III of a series of SES Design Manuals; Ref. Vol's I, II, IV.

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"Surface Effect Ships Aero/Hydrodynamics Technology Design Manual, volume IV, Tradeoff Influences and Testing", Oceanics, Inc., ASDB 10-U07897LM, (ADB004141), May 1974. Remarks: Part IV of a series of SES Design Manuals; Ref. Vol's I, II, III.

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"Investigations in SES Aero/Hydrodynamic Problem Areas", by P. Kaplan, M.N. Silbert, T.P. Sargent, Oceanics, Inc., RPT 74-108E, ASDB 10-U09526L, Sept. 1974.

OLMSTEAD
AUG 74
"Depression of an Infinite Liquid Surface by an Incompressible Gas Jet", by W.E. Olmstead, S. Raynor, Journal of Fluid Mechanics, Vol. 19, Aug. 1964, pp 561-576.

OZAWA
FEB 70
"Spring Constants of a Peripheral-Jet Air Cushion Vehicle in Heaving Motion", by S. Ozawa, in Japanese, with abstract in English. Available from Journal of Japan Society for Aeronautical and Space Sciences, Vol.18 (Feb.1970). Remarks: Static and dynamic spring constants of peripheral jet air cushion vehicle in heaving motion, obtaining sinusoidal input reponse characteristics.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
PAYNE, DEC, 76	-	-	B	B	B	B	-	-	-
PENNINGTON, OCT, 62	-	C	-	-	-	-	-	C	-
PERLMUTTER, 62	-	C	-	-	-	-	-	-	-
PLACKETT, APR, 78	-	-	-	-	C	-	-	-	-
PNEUMO, 60	-	-	-	-	C	C	-	-	-
PRINCTON, APR, 62	-	-	-	-	C	C	-	-	-
" 64	-	-	C	-	-	-	-	-	-
" 64	-	-	C	-	-	C	-	-	-
" DEC, 75	-	-	-	-	-	C	-	-	-

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PAYNE DEC 76	"The Summary Documentation of AALC Technology - Technology Baton 14 - Skirt System", Payne Inc., W.P. #209-3, Dec. 1976.
PENNINGTON OCT 62	"Hovercraft Navigation: Control Characteristics of Hovercraft", by W.A. Pennington, Institute of Navigation. Journal vol. 15, Oct. 1962, pp 359-364.
PERLMUTTER 62	"An Experimental Investigation of the Response Characteristics of Two Man Carrying Ground Effect Machines", by A.A. Perlmutter, M.M. Goerge, U.S. Army Transportation Research Command, 1962. TCREC-TR-62-28.
PLACKETT 17 APRIL 78	"Design Aspects of Seal Systems for Air Cushion Vehicles", by M.J. Plackett and R.B. Wade, AIAA 78-7551, April 17-19, 1978.
PNEUMO 60	"Practical Considerations of the Stability of Perpheral Jet Vehicles", by N.K. Walker, Pneumo Dynamics Corporation Systems Engineering Div., Bethesda, MD, 1960.
PRINCETON APR 62	"Stability Augmentation of Ground Effect Machines", T.A. Dukes, C.R. Hargraves, Princeton Univ. Dept of Aero. Eng., 1962, RPT 601 (AD 275-159).
PRINCETON 64	"The Dominant Aerodynamic Characteristics of a shaped GEM", by A.F. Wojciechowicz Jr., W.B. Nixon and T.E. Sweeney, Princeton Univ., Sept. 1964.
PRINCETON 64	"An Investigation of a Dynamic Instability of a Winged Ground Effect Machine", by P.M. Condit, J.E. Harrington, Princeton Univ. Dept of Aeronautical Engineering, 1964, Report AER-692, TRECOM-TR-64-54 (AD 610 040).
PRINCETON DEC 75	"Plenum Air Cushion/Compressor-Duct Dynamic Interactions", by L.M. Sweet, H.H. Richardson, D.N. Wormley, Princeton Univ., American Society of Mechanical Engineers, Winter Annual Meeting, Houston, Tex., Nov. 30-Dec. 4, 1975, 10 p. U.S. Department of Transportation Contract No. FR-10007. Also see ASME Paper No. 75-WA/Aut-23, April 1975.

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RAC, OCT, 64	-	C	-	-	-	-	-		-
ROBERTSON, OCT, 75	-	-	-	-	-	-	B		-
ROSENBLATT, FEB, 73	-	-	-	-	-	C	-	C	-
RUSSELL, MAY, 74	-	B	-	-	-	-	-	-	-

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RAC 20 OCT 64	"ZA-3 Air Cushion Vehicle Test Program", Republic Aviation Corp. Farmingdale, N.Y. Final rept. rac-2612, Oct 20, 1964.
ROBERTSON 21 OCT 75	"The Overturning Report", Air Cushion Vehicles, Flight International Suppl. 21 Oct. 1975.
ROSENBLATT FEB 73	"Conceptual Design Handbook for Surface Effect Ships", (draft copy), Rosenblatt (M.) and Son, Inc., Feb. 1973. Remarks: This is a manual to be used in conceptual design of surface effect ships covering topics in performance, configuration and propulsion. ASDB 10-U09218.
RUSSELL MAY 74	"Recent Developments in Hovercraft Performance Testing", by B.J. Russell, Hovering Craft and Hydrofoil, ASDB 10-U05948M, May 1974. Remarks: Internal hovering craft, hydrofoil and advanced transit system conference May 1974, England.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
SARGENT, SEPT, 76	-	C	-	-	-	-	-	-	-
SHEFFIELD U, MAY, 74	-	-	C	-	C	-	-	-	-
SILVERLEAF, MAR, 69	C	C	-	-	-	-	-	-	-
SIT, 61	-	-	-	C	-	C	-	-	-
" 62	-	-	-	C	-	-	-	-	-
SIT 63	-	-	-	C	-	-	-	-	C
" MAY, 70	-	B	-	-	-	-	-	-	-
" DEC, 76	-	-	-	-	-	B	-	-	-
SMITH, 62	-	-	C	-	C	-	-	-	-
SOUTHAMPTON U. DEC, 70	-	-	-	-	-	C	-	-	-
STANTON-JONES, FEB, 64	-	C	-	-	-	-	-	-	-
STAUFENBIEL, APR, 76	-	-	-	-	-	C	-	-	-
STOLLER, JUNE, 63	-	-	C	-	C	-	-	-	-
SULLIVAN, MAY, 75	-	-	C	C	C	C	-	-	-
SUSEQUEHANNA, FEB, 71	-	-	-	-	C	C	-	-	-
SWANSEA, SEPT, 64	-	-	C	C	C	C	-	-	-

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SARGENT
SEPT 76
"The U.S. Army LACV 30 Program (Lighter, Amphibian Air Cushion Vehicle-30 Ton Payload)", by Sargent and Faulkner, (SNAME/AIAA) SY Sept. 1976. Report number unknown.

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MAY 74
"Airflow Phenomena at Hoverskirt Edges", by P. Polak, Univ. of Sheffield, England, Int. Hovering Craft, Hydrofoil and Adv. Transit Syst. Conf., Brighton, Sussex, Engl. May 13-16, 1974, p. 15-20. Publ by Kalerghi Publ., London, Engl, 1974.

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"Comparison of Some Features of High Speed Marine Craft", by A. Silverleaf, F.G.R. Cook, Paper No. 5, Royal Inst. of Naval Architects, ASDB 10-U01449, March 1969.

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"Research on the Longitudinal Seakeeping Characteristics of Ground Effect Machines", Stevens Institute of Tech. Davidson Lab, 1961.

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"An Experimental Study of the Longitudinal Seakeeping Characteristics of the Bureau of Ships Hydroskimmer", by S.C.Y. Chen, I. Kowalski, Stevens Inst. of Tech. Davidson Lab, 1962, Report 904 (AD 283 666).

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"Motions and Accelerations of a GEM When Hove-To in Extreme Sea States", by Y.H. Chey, Stevens Institute of Tech. Davidson Lab, 1963, Report 977.

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MAY 70
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DEC 76
"FSACV Model Development Tests - Calm and Rough Water Performance and Stability Characteristics", by R.L. Van Dyck, Stevens Inst. of Tech., Final Rept. July 76- Jan. 77. SIT-DL-76-1921, Dec. 1976.

SMITH 62 — "Incompressible Flow About Bodies of Arbitrary Shape", A.M.O. Smith, Institute of the Aerospace Sciences, New York. 1962.

SOUTHAMPTON U. DEC 70 — "Dynamic Stability of Hovercraft Heave", by H. J. Davies, G.A. Poland, Southampton Univ., England. American Society of Mechanical Engineers, Journal of Applied Mechanics, Trans. ASME V.37 Ser E N.4 Dec. 1970 Paper 70-APM-QQQ. Remarks: Edge jet hovercraft dynamic stability in heaving motion, deriving two dimensional mathematical model.

STANTON-JONES FEB 64 — "Long Skirts Improve Obstacle Clearance", by R. Stanton-Jones, Interavia vol. 19, Feb. 1964, pp 230-232.

STAUFENBIEL APR 76 — "Stability and Control of Ground Effect Flying Machines in the Longitudinal Motion (Parts 1 and 2)", DTNSRDC, by R. Staufenbiel, Bao-Tzang Yeh, April 1976.

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SULLIVAN MAY 75 — "Air Cushion Technology Research at University of Toronto", by P.A. Sullivan, Hovering Craft and Hydrofoil, Vol. 14, No. 8, May 1975.

SUSEQUEHANNA FEB 71 — "Amphibious Assault Landing Craft", Susquehanna Corp, Costa Mesa, California, p. 125-135, Vol. IV, Calculations. ASDB 10-U03100LM, Feb. 1971.

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REFERENCE EVALUATION AND SUBJECT INDEX

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TORONTO U, JAN,71	C	C	C	C	C	C	-	-	-
TORONTO U, JUN,74	-	-	C	-	-	-	-	-	-
" JUN,77	-	-	-	-	-	C	-	-	-
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TRG, 62	-	-	B	-	-	-	-	-	-
TRILLO, 71	C	C	B	C	C	C			
TURNER, SEPT, 72	B	B	-	-	-	-	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

TORONTO U. JAN 71	"A Review of the Status of the Technology of the Air Cushion Vehicle", by P.A. Sullivan, Toronto, University, Canada. Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Michigan, Jan. 11-15, 1971. Remarks: Air cushion vehicle technology, considering economics, propulsion, structures, controllability, flexible skirt systems and R and D.
TORONTO U. JUN 74	"Air Cushion Technology Program at the University of Toronto" by P.A. Sullivan. Canadian Aeronautical & Space Journal Vol.20, No.6, June 1974, p. 269-286. Remarks: Static pitch tests on multicell and an open-loop and finger skirts are presented and the effect of installed power and lift fan characteristic on these are investigated.
TORONTO U. JUN 77	"Duct Effects on the Dynamic Fan Characteristics of Air Cushion Systems", by M.J. Hinchey, P.A. Sullvan, Institute for Aerospace Studies, Toronto Univ., Ontario, UTIAS Technical Note No. 211CN ISSN 0082-5263, June 1977.
TREBBLE	"Low-Speed Wind-Tunnel Tests on a 1/6 Scale Model of an Air-Cushion-Vehicle/Britten-Norman Cushioncraft C.C.2", by W.J.G. Trebbel, Aeronautical Research Council, London.
TRG 62	"The Lateral Stability of the Hydro-Skimmer Craft", by H.S. Bluston, Technical Research Group, New York, 1962, Report TRG-158-5R-1 (AD 277 116).
TRILLO 71	"Marine Hovercraft Technology", by R.L. Trillo, Hill Publications, ASDB 10-U05410, 1971.
TURNER SEPT 72	"Handling-Cold Weather Trials, BH-7", by E.C. Turner, Interservice Hovercraft Unit, ASDE 10-U04568LF, A13/1, Sept. 1972. Remarks: See 10-U04565L through 10-U04569L for other reports in this series.

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USATS, JUNE, 78	C	C	-	-	-	-	-	-	-

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USATS
JUNE 78

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" FEB, 71	-	-	-	-	-	C	-	-	-
" FEB, 71	-	-	B	-	-	-	-	-	-
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VTL, MAY, 74	C	-	-	-	-	-	-	-	-
" MAY, 76	B	B	-	-	-	-	-	-	-
" MAR, 77	B	B	B	B	C	C	-	C	-

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VACHASOV 72 — "Analysis of the Longitudinal Perturbed Motion of a Ground Effect Flight Vehicle", by E.P. Vachasov, G.F. Kurochka, L.G. Sanzharevskii, Iu. F. Usik, Samoletbostroenie I Teckhnika Vozdushnogo Flota, No. 29, 1972, p. 7-13. In Russian.

VKI FEB 71 — "Dynamic Stability of Air Cushion Vehicles" by J.B. van den Brug, Von Karman Institute for Fluid Dynamics, Lecture Series 33, Feb. 1971, ASDB 10-U03070. Remarks: Von Karman Inst. Lect. Series 33 on ACVS.

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VKI FEB 71 — "Aerodynamics of Air Cushion Vehicles: The External Aerodynamics of Hovercraft", by E.J. Andrews, Von Karman Institute for Fluid Dynamics Lecture Series 33, Feb. 1971.

VLEGHERT 75 — "The Development of Rapid Transport Over Water", by J.P.K. Vleghert, in Nederlandse Vereniging Voor Luchtvaart Techniek, Yearbook 1974, Luchtvaarttechniek, 1975, p. 1-1 to 1-11. In Dutch.

VRC MAY 62 — "On the Dynamic Heave Motion of Single Peripheral Jet GEMS Over an Undulating Surface", by P.J. Mantle, Vehicle Research Corp., Paper no. 9, May 1962.

VTL MAY 74 — "Hovercraft from a Shipbuilder", by A.F. Bingham, Vosper Thornycroft Ltd., Int. Hovering Craft, Hydrofoil and Adv Transit Syst. conf. Brighton, Sussex, Eng., May 13-16, 1974, p. 421-428. Published by Kalerghi Publ. London, Engl., 1974.

VTL MAY 76 — "Design and Operating Features of Vosper Thornycroft Skirts", by Raymond Kyke, Vosper Thornycroft Ltd., Int. Hovering Craft, Hydrofoil and Adv. Trans. Syst. Conf. 2nd, Amsterdam, Neth, May 17-20, 1976, Sponsored by Hovering Craft and Hydrofoil J. 1976 pp 129-147.

VTL MAR 77 — "Air Propelled Air Cushion Vehicles", Vosper Thornycroft Ltd., Report No. P61/7701, March 1977, for the U.S. Navy Advanced Naval Vehicles Concept Evaluation, U.S. Naval Regional Procurement Office, London Division.

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" 64	-	-	-	-	-	C	-	-	-
WALKER, 65	-	-	-	C	C	C	C	C	-
" JULY, 65	-	-	-	C	-	C	-	-	-
" JUNE, 65	-	-	C	-	C	-	-	-	-
" -	-	-	C	-	C	-	-	-	-
WEST, SEPT, 64	-	-	-	-	C	C	-	-	-
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" OCT, 75	B	B	-	-	-	-	-	-	-
WRIXON, FEB, 69	-	C	-	C	-	C	-	-	-

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WADE MAY 1971 — "Some Aspects of Hovercraft Aerodynamics", by R.G. Wade, Canadian Aeronautics and Space Journal, 1971, pp 39-42.

WALDO JULY 67 — "Some Special Problems in Surface Effect Ships", by R.D. Waldo, American Institute of Aeronautics and Astornautics, New York 1967, Paper 67-346.

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WALKER 62 — "The Effect of the Vertical Position of the Center of Gravity on the Stability of an Annular Jet Ground effect Machine", by N.K. Walker, A. Anthony, N.K. Walker Associates, Inc, Bethesda, MD, US. Army Transportation Research Command., 1962, TCREC-TR-62-101 (AD-297-218).

WALKER 64 — "Influence of Fan and Ducting Characteristics on the Stability of Ground Effect Machines", by N.K. Walker, American Institute of Aeronautics and Astronautics, New York, 1964, Paper 64-185.

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WALKER JULY 65 — "Heave Stability and Heave Damping of Ground Effect Machines: Thick Annular Jet and Plenum Types: Final Report", N.K. Walker, D.A. Shaffer, N.K. Walker Associates, Inc. Bethesda, MD, 1965. Report 14, US Army Aviation Materiel Laboratories, USAAVLABS-TR-65-26 (AD 621-515).

WALKER JUNE 65 — "Roll Stability of Ground Effect Machines: Thick Annular Jet and Plenum Types", N.K. Walker, D.A. Shaffer, A. Anthony, R. Brooks, N.K. Walker Associates Inc., 1965, Report 13, US Army Aviation Materiel Laboratories, USAAML-TP-65-27 (AD 617-129).

WALKER — "Analysis of the Results of Wind Tunnel Tests on a Circular Model Ground Effect Machine-Report No. 6", by N.K. Walker, R.J. Neal, Walker Associates, Inc., ASDB 10-U09483. Remarks: This report presents the results of an analysis for interpreting data on the stability and control of GEMS.

WEST AUG-SEPT 64	"Effect of Forward Speed on a Two Dimensional Ground Effect Machine", A.A. West, Hovering Craft and Hydrofoil, Vol. 3, Aug.-Sept. 1964, pp. 23-25.
WESTWOOD MARCH 68	"Preliminary Parametric Analysis of Air Cushion Vehicle Design Characteristics and Performance Potentials", Westwood Research, Inc., ASDB 10-U03017LF, March 1968. Remarks: Report describes results of a study of ACV characteristics for coastal and riverine coperations.
WHEELER MAY 71	"Control of Single Propeller Hovercraft with Particular Reference to BH.7", by R.L. Wheeler, Canadian Aeronautics and Space Journal, May 1971, pp 189-206.
WHEELER OCT 75	"Appraisal of Present and Future Large Commercial Hovercraft", by R.L. Wheeler, Royal Institution of Naval Architects, ASDB 10-U09088, Oct. 1975. Remarks: Review of British Hovercraft operational experience and future projections.
WRIXON FEB 69	"Control and Stability Seminar" by T.R. Wrixon, Air Cushion Vehicles, Vol. 13, Feb. 1969, pp 7-9.

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YAMAMOTO, FEB, 70	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

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YAMAMOTO
FEB 70

"Non Linear Heaving Motion of Plenum Chamber Type Air Cushion Vehilces", by A. Yamamoto, in Japanese with abstract in English), Japan Society for Aeronautical and Space Sciences, Journal No. 18, Feb. 1970, pp 73-78.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
ZEITFUSS, APR, 72	-	-	B	-	B	-	-	-	-

A = 1st Class Material, Important to Program

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ZEITFUSS
APR 72

"Prediction of Static Aerodynamic Characteristics of Air Cushion Vehicles Through 180 Degree of Yaw", by W. Zeitfuss, Jr., and F.N. Brooks, Jr., Journal of Aircraft, Vol. 9, No. 4, Apr. 1972. ASDB 10-U04249.

BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY SUPPORTED CRAFT

VOLUME III

A CATEGORIZED BIBLIOGRAPHY OF RIGID SIDEHULL SES STABILITY RELATED REPORTS

by

David R. Lavis
Edward G.U. Band
Alexander W. Fowler
Edgar D. Hoyt

Task 1 Report
Contract No. DOT-CG-806510-A

for

U. S. Department of Transportation
United States Coast Guard
Office of Research and Development
Washington, D. C. 20590

INTRODUCTION

This document contains a categorized bibliography of Rigid Sidehull Surface Effect Ship (SES) stability related reports. It is one of a series of bibliographies which have been prepared for the United States Coast Guard's (USCG's) investigation of the stability of dynamically supported craft. The other bibliographies in this series are:

- A Bibliography of Air Cushion Vehicle (ACV) Stability Related Reports.
- A Bibliography of Hydrofoil Craft Stability Related Reports.
- A Bibliography of Planing Craft Stability Related Reports.
- A General Bibliography of Ship and Small Craft Stability Related Reports.

Entries in the bibliography have been made in alphabetical order using the Author's company (or affiliation) or Author's last name if his company and affiliation are unknown or are less descriptive of the source.

A "Reference Evaluation and Subject Index" table is provided for each group of alphabetical entries. These tables provide an indication of the relevance or value of each document to the study of craft stability and also places each within one of nine separate subject categories. The value of each document to the subject of craft stability has been indicated by assigning a letter A, B, or C to each entry using the following classification.

A: First Class Material, Important to Program

B: Supporting Material

C: Useful but not Essential to Program

The subjects into which each document has been categorized are defined as follows:-

Full Scale Operations, Static

Report contains full scale information of a non-dynamic nature, e.g. static stability testing, (craft stationary and/or at forward speeds) and/or general steady state operational behavior, including operators overall assessments.

Full Scale Operations, Dynamic

Report contains full scale information on craft dynamic behavior, e.g. seakeeping, maneuvering, response transients, dynamic stability, or dynamic behavior in general including operators overall assessments.

Model Tests, Static

Report contains model test information of a non-dynamic nature, e.g. craft and component static stability testing (model stationary and/or at forward speeds), calm water resistance tests, including test results and/or descriptions of test techniques.

Model Tests, Dynamic

Report contains test information on model dynamic behavior, e.g. towing tank or free (maneuvering) model dynamic tests, dynamic transient tests, seakeeping including surf tests, results and/or description of test techniques.

Analytical Studies, Static

Report contains analytical studies related to craft static stability.

Analytical Studies, Dynamic

Report contains analytical studies related to craft dynamic stability, e.g. analyses of craft capsizing, seakeeping, maneuvering, motion response, acceleration response, hull slamming, survivability.

Accident Reports

Report contains a specific account of, comment on, or analysis of a craft stability related accident which has resulted in property damage, personal injury or loss of life.

Criteria

Report contains information on craft stability related criteria, e.g. specific criteria or standards, design guidelines or practices for adequate craft stability, human tolerance to craft motions, safety limits, regulatory issues and standards.

Environment

Report contains information concerning weather conditions, e.g. wind, sea state, icing etc. Report may also contain information on forcast and hindcast techniques, and probabilistic description of severity.

The bibliography has been compiled from a fairly comprehensive search of the following sources.

1. The National Technical Information Service (NTIS)
2. The Royal Institution of Naval Architects (RINA)
3. Society of Naval Architects & Marine Engineers (SNAME)
4. North Carolina Science & Technology Research Center
5. U.S. Naval Academy Library
6. David W. Taylor Naval Ship Research & Development Center (DTNSRDC)

7. American Institute of Aeronautics & Astronautics (AIAA)
8. American Society of Mechanical Engineers (ASME)
9. U.S. Department of Transportation (DOT)
10. Engineering Index Inc. New York, N.Y.
11. Maritime Research Information Service (MRIS)
12. The British Ship Research Association (BSRA)
13. National Aeronautics & Space Administration (NASA)
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15. Robert Trillo Ltd. Hampshire, U.K.
16. Band, Lavis & Associates, Inc., Severna Park, MD.

GLOSSARY

ACC	Aerojet General Corporation
BAT	Bell Aerospace Textron
DAEDALEAN	Daedalean Associates, Inc.
DOC	Department of Commerce
DTNSRDC	David W. Taylor Naval Ship Research and Development Center
GOODRICH	B. F. Goodrich Company
HOVERMARINE T.	Hovermarine Transport
JHAPL	Johns Hopkins Applied Physics Laboratory
LMSC	Lockheed Aircraft Corporation
MARITIME D	Maritime Dynamics
NAEC	Naval Air Engineering Center
NAS	National Academy of Sciences
NAVSEC	Naval Ship Engineering
NPS	Naval Postgraduate School
OCEANICS	Oceanics, Inc.
ROHR	Rohr Corporation
ROSENBLATT	Rosenblatt (M.) and Son, Inc.
SESPO	Surface Effect Ships Project Office
SIT	Stevens Institute of Technology
SNAME	Society of Naval Architects and Marine Engineers
STI	Systems Technology, Inc.

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" JAN, 74	B	B	B	B	B	B	-	-	-
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AGC, MAY, 74	B	B	-	-	-	-	-	-	-
" JULY, 74	C	-	-	-	-	-	-	-	-

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AGC
MAY 69
"Surface Effect Ships Craft Dynamics Program", Final Report, Aerojet General Corp., Report No. 9132FR-1, May 1969.

AGC
JAN 70
"100 Ton SES Waterjet Testcraft Progarm-Desogn Description Report; Vol. 1 (Sections 1-111)", Aerojet General Corp., SES-E-A005, ASDB 10-U05368LM, Jan. 1970.

AGC
MAY 73
"100-Ton SES Waterjet Testcraft Program Model Test Report 1/8-Scale Verification Test Report Part 1 Test Data and Configuration", Aerojet General Corp., AGC-T 385 Part 1, ASDB 99-U00511, May 1973. Remarks: SES Technical Library File No. 0920064. See DB/No. 99-U00510.

AGC
MAY 73
"100-Ton SES Waterjet Testcraft Program Model Test Report, Part 11, Summary and Analysis, Aerojet General Corp., AGC-T 385, Part 2, ASDB 00-U00510, May 1973. Remarks: SES Technical Library File no. 0920065. See DB/No 99-U00511.

AGC
OCT 73
"SES-100A Test Group IV and V Test", Aerojet General Corp., AGC-T 427, ASDB 99-U00324L, Oct. 1973. Remarks: SES Technical Library File No. 0920063.

AGC
OCT 73
"Development of the USN Surface Effect Ship, SES 100B", by P.J. Mantle, Aerojet General Corp., Naval Engineers Journal, V. 85 N5, pp 65-75, Oct. 1973.

AGC
NOV 73
"SES 100A Stability and Control Analysis Report Appendices", Aerojet General Corp., T 414, ASDB 10-U09321L, Nov. 1973. Remarks: Appendices dealing with SES 100A horizontal and vertical plane motions and stability.

AGC
NOV 73
"SES 100A Stability and Control Analysis Volume 11", Aerojet General Corp., T-414, ASDB 10-U09322L, Nov. 1973. Remarks: SES-100A stability, controllability and habitability requirements. Report includes analytic approach and model tests.

AGC
JAN 74
"SES 100A Testcraft Group VI Test Report", Aerojet General Corp., AGC-T-461, ASDB 10-U09110L, Jan. 1974. Remarks: Report covers predictions and testing of the SES 100A encompassing test runs 47 through 52.

AGC
FEB 74
"100 Ton SES Testcraft Program; Report for Test Run 63", Aerojet General Corp., AGC-T 478, Feb. 1974. Remarks: A craft motions test was run on the SES-100A but no data taken because of center fan IGV system failure run 63.

AGC FEB 74	"A Review of the U.S. Navy's SES-100A Program", Aerojet General Corp., AIAA Paper No. 74-316, AIAA/SNAME Advanced Marine Vehicles Conference, San Diego, CA, Feb. 25-27, 1974, by George D. Wescot.
AGC MAY 74	"SES-100A Testcraft Program, Group VII and VIII Test and Evaluation Report", Missions 1-96, Aerojet General Corp., May 1974.
AGC JULY 74	"SES Air System Analysis Support Report", Aerojet General Corp., ASDB 10-U09184L, July 1974. Remarks: Report discussing all operational problems related to ship and helicopter/VSTOL interfaces.

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"	AUG,	73	B	B	-	-	-	-	-	-	-
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"	FEB,	74	B	B	B	B	-	-	-	-	-
"	APR,	74	B	B	B	B	-	-	-	-	-
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"	DATE UNKNOWN		B	B	-	-	-	-	-	-	-

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BALQUET 77	"Some Specific Hydrodynamic and Aerodynamic Problems of Surface-Effect Ships with Sidewalls", by R.J. Balquet and F. Jodelet, Association Technique Maritime et Aeronautique, Bulletin No. 77, 1977, pp 415-429. In French.
BAT DEC 68	"SES System Specification", Bell Aerospace, RPT-7308-947001, ASDB 10-U09423, Dec. 1968. Remarks: General specification for an SES developed under Marad Contract-MA-4678.
BAT APR 71	"Weight and Balance Handbook for SES 100B", Bell Aerospace Co., RPT-7308-942002, ASDB 10-U09384, Apr. 1971.
BAT MAY 71	"Recommended Modification of LC JEFF(B) Wave Impact Load Criteria", by W.H. Buckley, Bell Aerospace Co., ASDB 10-U03952LM, May 1971.
BAT AUG 73	"SES 100B Mission Test Report", Bell Aerospace Co., MA-4678, ASDB 10-C00748, Aug. 1973.
BAT SEPT 73	"Test and Evaluation Final Report" Bell Aerospace Co., SES-100B, Missions 155-208, Sept. 1973.
BAT NOV 73	"SES-100B Mission Test Report", Bell Aerospace Co., ASDB 99-U 00323L, Nov. 1973.
BAT DEC 73	"Hydrodynamic Test Program", Bell Aerospace Co., BOA-927002, ASDB 10-U09348. Remarks: Results of hydrodynamic tests conducted on a 1/30th scale model of the Bell 2KSES.
BAT DEC 73	"Bow and Stern Seal Design Optimization", Bell Aerospace Co., BOA-027003, ASDB 10-U05115LM, Dec. 1973.
BAT JAN 74	"Hydrodynamic Test Program", Bell Aerospace Co., BOA-927002, ASDB 10-U09114L, Jan. 1974. Remarks: Results of hydrodynamic tests conducted on a 1/30-TH scale model of the Bell 2KSES.
BAT FEB 74	"Hydrodynamic Stability of Partially Submerged Thin Profiles at High Froude Numbers", by G.C.C. Smith, and R.P. Shaw, Bell Aerospace Co., 74-315, AIAA/SNAME Advanced Marine Vehicles Conference, Feb. 1974.

BAT FEB 74	"Test and Evaluation of the SES-100B", by C.L. Forrest, Bell Aerospace Co., 74-317, AIAA/SNAME Conference, Feb. 1974.
BAT APR 74	"SES 100B Test and Evaluation Progarm Mission Test Report for Mission No. TE-010-0183-0421", Bell Aerospace Co., ASDB 10-U09146L, April 1974. Remarks: Results of full scale tests of SES 100B measuring stability, habitability and certain structural responses are reported.
BAT APR 74	"SES-100B Test and Evaluation Program Mission Test Report for Mission TE-007-0232-1212", Bell Aerospace Co., ASDB 10-U09147, MA-4678, April 1974. Remarks: Calculations, data, procedures, summary of performance at 50 knots with lift power setting 3, 3 trim pitch settings, propulsion engine power data for SES 100B testcraft mission TE-007-0232-1212.
BAT MAR 76	"DTNSRDC Carriage III Tow Tank Test of 1/30 Scale Bell 2000 Ton SES Model", by J.A. Dijoseph, Bell Aerospace Co., TM-16-76-42, ASDB 10-U07669LM, March 1976. Remarks: Details of BACNOO SM-2 Model. No detailed analysis given, qualitative comments only.
BAT JULY 76	"Theoretical Hydrodynamic Coefficients of Laterally Oscillating Profiles at High Froude Number", by G. Smith and C. Charles, Richard P. Shaw, Bell Aerospace Textron, Journal Hydronautics v. 10 N3, July 1976.
BAT	"SES 100B Test and Evaluation Program Mission Test Report for Mission No. TE-027-0212-0918, Bell Aerospace Co., ASDB 10-U09505L, MA-4678. Remarks: Results of full scale SES 100A testcraft trials for stability, habitability, structural responses.

REFERENCE EVALUATION AND SUBJECT INDEX

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CHAPLIN, NOV, 78	-	-	-	-	B	B	-	B	-

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CHAPLIN 14 NOV 78	"Surface Effect Applications for Small Vessels", by J.B. Chaplin, EUROPORT '78, Naval Construction & Equipment Conf., Amsterdam, Holland, 14-16 Nov. 1978.

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
DECKER,	JUNE, 70	C	C	-	-	-	-	-	-	-
DAEDALEAN,	SEPT, 74	-	-	-	-	-	C	-	-	-
DOC,	FEB, 66	-	-	-	-	C	-	-	-	-
DTNSRDC,	MAY, 67	-	-	A	-	-	-	-	-	-
"	MAY, 68	-	-	C	C	-	-	-	-	-
DTNSRDC	JULY, 68	-	-	A	-	-	-	-	-	-
"	SEPT, 68	-	-	A	-	-	-	-	-	-
"	NOV, 68	-	-	B	-	-	-	-	-	-
"	NOV, 68	-	-	-	-	C	C	-	-	-
"	DEC, 68	-	-	-	-	B	-	-	-	-
DTNSRDC,	DEC, 68	-	-	C	-	-	-	-	-	-
"	MAR, 69	-	-	A	-	A	-	-	-	-
"	SEPT, 69	-	-	A	-	-	-	-	-	-
"	NOV, 69	-	-	-	-	-	C	-	-	-
"	AUG, 71	-	-	C	-	-	-	-	-	-
DTNSRDC,	OCT, 71	-	-	-	-	B	B	-	B	-
"	MAY, 74	C	C	-	-	-	-	-	-	-
"	MAR, 75	C	C	C	C	C	C	-	-	-
"	MAR, 75	-	B	-	-	-	-	-	-	-
"	MAY, 75	-	-	-	-	C	C	-	-	-

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
DTNSRDC,	MAY, 75	B	B	B	B	-	-	-	-	-
"	MAY, 75	-	-	-	C	-	-	-	-	-
"	JULY, 75	-	-	-	-	C	C	-	-	-
"	OCT, 75	C	C	C	C	C	C	-	-	-
"	APR, 76	-	C	-	C	-	-	-	-	-
DTNSRDC,	MAY, 76	-	-	-	C	-	C	-	-	-
"	MAY, 76	-	-	-	-	-	B	-	-	-
"	MAY, 76	-	B	-	-	-	B	-	-	-
"	JULY, 76	-	-	-	B	-	-	-	-	-
"	JULY, 77	-	B	-	B	-	B	-	-	-
DTNSRDC,	AUG, 77	-	-	-	C	-	-	-	-	-

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DECKER JUNE 70	"Surface-Effect Ships Approach a New Beginning", by J.L. Decker, AIAA, pp54-63, ASDB 10-U03837M, June 1970.
DAEDALEAN SEPT 74	"Linearized Air Cushion Dynamics for Large Surface Effect Vehicles", by R.K. Muench, ASDB 10-U05454L, Daedalean Associates, Inc., Sept. 1974.
DOC FEB 66	"Surface Effect Ships for Ocean Commerce a Study of the Technological Problems by the SESOC Advisory Committee", Department of Commerce, ASDB 10-U03629, Feb. 1966.
DTNSRDC MAY 67	"Captured Air Bubble Vehicle Stability Tests", by Robert A. Wilson, DTNSRDC, AIAA/SNAME, May 22-24, 1967, Paper 67-349.
DTNSRDC MAY 68	"Resistance and Performance Tests of Bell Aerosystems SES Model B-12 in Smooth Water and Waves", by F. R. Grafton, ASDB 10-U03408L, May 1968.
DTNSRDC JULY 68	"Stability Test of Bell Aerosystems SES Model B-12 in Calm Water", by H.D. Holling, DTNSRDC, ASDB 10-U03414L, July 1968.
DTNSRDC SEPT 68	"Systematic Variations of Design Parameters Affecting Turn Stability of Captured Air Bubble (Cab) Vehicles and Their Experimental Evaluation", by R.A. Wilson, DTNSRDC, ASDB 10-U04908LM, Sept. 1968.
DTNSRDC NOV 68	"Data Report for phase I of an Experimental Aerodynamic Study of the Captured Air Bubble Surface Effect Ship", by F. Wilson, DTNSRDC, ASDB 10-U09433L, Nov. 1968. Remarks: Tabulated data obtained form aerodynamic tests conducted on a model of an SES craft.
DTNSRDC NOV 68	"Captured-Air-Bubble Cushion Air System Study, Phase I - Heave Motion Analysis and Preliminary Fan Design", by J.R.N. Rajan, T.G. Csaky, DTNSRDC, Annapolis, Rept. No. 144/68, Nov. 1968.
DTNSRDC DEC 68	"Correlation of Available Data for Captured Air Bubble Vehicles", by C.W. Harry, R.A. Wilson, A.G. Ford, DTNSRDC, ASDB 10-U04653LM, Dec. 1968.
DTNSRDC DEC 68	"Performance Characteristics of a 1/2-Scale Model of the XR-3 Captured Air Bubble Vehicle", by M.D. Fink, C.W. Harry, DTNSRDC, ASDB 10-U04670LM, (AD857127L), Dec. 1968.

DTNSRDC
MAR 69

"Design Parameters Affecting Turn Stability of Captured Air Bubble Vehicles", by R.A. Wilson, DTNSRDC, RPT-2965, ASDB 10-U03968LF, (AD851091L), March 1969. Remarks: Results of calm water tests for steady State turn stability for different design configurations for cabs.

DTNSRDC
SEPT 69

"Data Report for an Aerodynamic Force Study on Variable Length to Beam Ratio Captured Air Bubble Surface Effect Ships (Phase II-III)", by F. Wilson, DTNSRDC, ASDB 10-U09415L, TN-AL-136, Sept. 1969. Remarks: Data report presenting aerodynamic force and stability characteristic of high length to beam craft, and information on tests of different pilot house configurations.

DTNSRDC
NOV 69

"Heaving and Pitching Motion Analysis and Fan System Design for Captured Air Bubble Crafts", by J.R.N. Rajan, T.G. Csaky, DTNSRDC, Nov. 1969.

DTNSRDC
AUG 71

"Results of Several XR-1B Model Tests in Plotted Form Part I, II and III (Ram Inlet Data)", by C.W. Harry and R.A. Wilson, DTNSRDC, ASDB 10-U-02039M, (AD887438), August 1971.

DTNSRDC
OCT 71

"Design and Evaluation Study of the Partial-Length-Sidewall SES Concept", by R.A. Wilson, DTNSRDC, ASDB 10-U04571LF, (AD913100L), Oct. 1971.

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MAY 74

"Trials and Evaluation Plan for the XR-5 High Length to Beam Ratio Surface Effect Ship", by M.A. Kido and R.R. Jones, DTNSRDC, ASDB 10-U06268LM, (AD8001457), May 1974.

DTNSRDC
MAR 75

"Seakeeping Characteristics of the XR-5, A High Length to Beam Ratio Planned Surface Effect Testcraft: II. Results of Linearity Investigation, Effects of Changes", by A.H. Magnuson and K.K. Wolfe, ASDB 10-U06460,(ADA009321), DTNSRDC, March 1975.

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MAR 75

"Seakeeping Characteristics of the XR-5, a High Length-Beam Ratio Manned Surface Effect Testcraft: I. XR-5 Model Response in Regular Head Waves", by A.H. Magnuson and K.K. Wolff, DTNSRDC, ASDB 10-U06386M, March 1975.

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MAY 75

"Cushion Pressure Properties of a High Length-to-Beam Ratio Surface Effect Ship", by David D. Moran, DTNSRDC, SPD-600-01, May 1975.

DTNSRDC MAY 75	"Survey of Experimental Data for Validating Surface Effect Ship Computer Simulations", by A. Gersten, J. Ricci, DTNSRDC, ASDB 10-U06457LM, May 1975.
DTNSRDC MAY 75	"Wave Height Under a High Length-to-Beam Ratio Surface-Effect Ship in Regular Waves". by D.D. Moran. DTNSRDC, ASDB 10-U06492M, (AD-A011440), May 1975.
DTNSRDC JULY 75	"A Discrete Vortex Method for Predicting Hydrodynamic Loads on Sidewalls of Surface Effect Ships", by Tsze C. Tai and Robert E. Whitehead, DTNSRDC, Aero-1240, Sept. 1977.
DTNSRDC OCT 75	"Technical Summary of Air Cushion Craft Development", by P.J. Mantle, DTNSRDC,-4727, Oct. 1975.
DTNSRDC APR 76	"Statistical Analysis of Data from SES Slamming Experiments", by A. Gersten, DTNSRDC, ASDB 10-U08657LM, April 1976.
DTNSRDC MAY 76	"Seakeeping Characteristics of the XR5, a High Length-Beam Ratio Manned Surface Effect Testcraft: III. Results of Random Wave Experiments Investigation of Linear Superposition for Ship Motions and Trim and Draft in Random Waves", by J.J. Ricci and A.H. Magnuson, DTNSRDC, ASDB 10-U08573M, (ADA036332), May 1976.
DTNSRDC MAY 76	"Extreme Values of Surface Effect Ship (SES) Responses in a Seaway. Part I. Estimation of Extreme values for SES Design Consideration", by M.K. Ochi, DTNSRDC, ASDB 10-U08944, (ADA030002) May 1976.
DTNSRDC MAY 76	"Extreme Values of Surface Effect Ship (SES) Responses in a Seaway. Part II-Extreme Value Analysis of SES 100B Test Results", by M.K. Ochi, ASDB 10-U08630, DTNSRDC, May 1976.
DTNSRDC JULY 76	"Wave Excitation and Vertical Plane Oscillation Experiments of a High Length-to-Beam Ration Surface Effect Ship", by James A. Fein and Lawrence O. Murray, DTNSRDC, SPD-697-01, July 1976.
DTNSRDC JULY 77	"Seakeeping Characteristics of a High Length-to-Beam Ratio Surface Effect Ship", by D.D. Moran, J.A. Fein, J.J. Ricci, Jr. DTNSRDC J. or Hydronautics v. 11, n3, July 1977, pp 74-84.
DTNSRDC AUG 77	"Twin Cushion Surface Effect Vehicle Head Sea Regular Wave Seakeeping Experiment", by M.J. Davis, S.H. McGuigan, D. Huminik, J.A. Bonilla-Norat, DTNSRDC, SPD-729-01, August 1977.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
FORREST, FEB, 74	B	B	B	B	B	B	-	-	B

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FORREST FEB 74	"Test and Evaluation of the SES-100B", by C.L. Forrest, AIAA/SNAME, Paper No. 74-317, February 1974, ASDB10-U05627M.

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
HABERCOM,	FEB, 75	C	C	-	-	-	-	-	-	-
"	JUNE, 76	C	C	-	-	-	-	-	-	-
"	JUNE, 76	C	C	-	-	-	-	-	-	-
"	MAY, 77	C	C	-	-	-	-	-	-	-
"	AUG, 77	C	C	-	-	-	-	-	-	-
HOVERMARINE,	JULY, 72	B	B	-	-	-	-	-	-	-
"	JULY, 72	B	B	-	-	-	-	-	-	-

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[illegible] Supporting Material

HABERCOM FEB 75	"Surface Effect Vehicles/Ships in Marine Environments (A Bibliography with Abstracts)", by Guy E. Habercom, Jr., C4383G4, NTIS, February 1975, Rept. for 1964-Oct 74, 113 p.
HABERCOM JUNE 76	"Surface Effect Vehicles/Ships in Marine Environments" (Citations from the NTIS Data Base), by Guy E. Habercom, Jr., NTIS, Rept for 1964-May 76, C6881kl, 159 p.
HABERCOM JUNE 76	"Surface Effect Vehicles/Ships in Marine Environments" (Citations from the Engineering Index Data Base), by Guy E. Habercom, Jr., Rept. for 1972-May 76, C6881K2, June 1976, 119 p.
HABERCOM MAY 77	"Surface Effect Vehicles/Ships in Marine Environments" (Citations from the NTIS Data Base), NTIS, by Guy E. Habercom, Jr., Rept. for 1964-May 77, D3054B3, August 1977, 211 p.
HABERCOM AUG 77	"Surface Effect Vehicles/Ships in Marine Environments" (Citations from the Engineering Index Data Base), by Guy E. Habercom, Jr., Rept. for 1972-May 77, D3054B4, NTIS, August 1977, 149 p.
HOVERMARINE T JULY 72	"Report on Performance and Habitability Trials on the Hovermarine HM2 MK.3-XW555-Appendix 6", Hovermarine Transport, (AD912378L), HTL-72/D111, ASDB 10-U03771LF, July 1972.
HOVERMARINE T JULY 72	"Report on Performance and Habitability Trials on the Hovermarine HM2 MK3:XW555 Vol. 3", Hovermarine Transport, ASDB 10-U037681F, (AD912375L), July 1972.

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IOWA U., NOV, 75	-	-	-	-	C	-	-	-	-

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IOWA U
NOV 75

"On the Wave Resistance of Surface-Effect Ships", by J.C. Tatinclaux, Univ. of Iowa. Trans. SNAME 1975.

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KAPLAN, FEB, 74	-	-	-	-	-	C	-	-	-
" MAY, 74	-	-	-	-	B	B	-	-	-

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KAPLAN FEB 74	"Simplified Representation of the Vertical Plane Dynamics of SES Craft", by P. Kaplan and S. Davis, AIAA/SNAME, Paper No. 74-314, February 1974.
KAPLAN MAY 74	"Lateral Dynamics of Sidewall SES Craft", by P. Kaplan and S. Davis, Hovering Craft and Hydrofoil, May 1974.

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REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
LAVIS,		78	-	B	-	-	B	B	-	-	-
LAYTON,	SEPT,	76	-	-	-	-	C	C	-	-	-
LMSC,	DEC,	70	-	-	-	-	B	B	-	-	-
"	MAR,	73	-	-	B	B	-	-	-	-	-
"	DEC,	73	-	-	-	-	-	C	-	-	-
LMSC,	DEC,	73	-	-	-	-	-	C	-	-	-
"	DEC,	73	-	-	-	-	-	B	-	-	-
"	DEC,	73	-	-	-	-	-	C	-	-	-
"	DATE UNKNOWN		B	B	-	-	-	-	-	-	-
LMSC,	OCT,	75	B	B	-	-	-	-	-	-	-

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LAVIS 78	"Surface Effect Vehicles: Principles and Applications", co-author, (Dynamic Stability and Control) to be published, Pennsylvania State Press. Contributions by D.R. Lavis.
LAYTON SEPT 76	"The Effects of Bow Seal Shape on the Performance of a Captured Air Bubble Surface Effect Ship (SNAME/AIAA)", by Donald M. Layton September 1976. Report number unknown.
LMSC DEC 70	"Study of Steering and Control Devices for Surface Effect Ships-Vol. I-Analysis", by K. P. Kerr, Lockheed Aircraft Corp., ASDB 10-U04156LM, (AD882960), December 1970.
LMSC MAR 73	"SES 100(B) Model Tests Data Report", by R.G. Wright and R.M. Hopkins, Lockheed Missiles and Space Co., ASDB 10-U09233, LMSC/5724-73-040, March 1973. Remarks: Report presents the results of tests conducted on a 1/10-53 model of the SES-100B Craft (motions and forces).
LMSC DEC 73	"Final Report BOA Task 0004 to Contract No. N00024-73-A-0919 Perform Tasks Related to the 2000-Ton Surface Effect Ship Vol. 5 Item 0005: Effect of Craft Structure on Vibration and Ride", Lockheed Missiles and Space Co., LMSC-D357333, ASDB 10-U09523L, Dec. 1973.
LMSC DEC 73	"Perform Tasks Related to the 2000-Ton Surface Effect Ship Final Report BOA Task 0004", by R.S. Johnstone, Lockheed Missiles and Space Co., LMSC D357333, ASDB 10-U09351L, Dec. 1973. Remarks: A simulation of SES motions in a seaway and lift system dynamics is described.
LMSC DEC 73	"Craft Motion Analyses, Final Report; Vol. 2", Lockheed Aircraft Corp., LMSC-D357333, ASDB 99-U00204L, Dec. 1973. Remarks: SES Technical Library File No. 0510180.
LMSC DEC 73	"Effect of Craft Structure on Vibration and Ride-Final Report, Vol. 5", Lockheed Aircraft Corp., ASDB 99-U00211L, Dec. 1973.
LMSC	"Group Analysis Report for SES 100B Missions 278 thru 323", Lockheed Missiles and Space Co., LMSC/D458878, ASDB 10-U09491L. Remarks: Performance, stability, and loads data derived from SES 100B T & E Missions 278 through 323 have been evaluated, analyzed and correlated.

LMSC JULY 74	"Task 2 Item A003: One Hundred Ton Mission Design Study", Lockheed Missiles and Space Co., LMSC-D403194, ASDB 10-U09170L, July 1974. Remarks: Study examines 100A Testcraft as possible weapons platform.
LMSC OCT 75	"Mission Analysis Report for SES 100B Missions 287/317", Lockheed Missiles and Space Co., LMSC/D458873, ASDB 10-U09090L, Oct. 1975. Remarks: This report presents the results and analysis of performance stability and loads data derived form SES-100B T & E Missions 287/317.
LMSC MAR 76	"DTNSRDC Carriage III Tow Tank Test of 1/30 Scale Bell 2000 Ton SES Model", by J.A. Dijoseph, Lockheed Aerospace Co., ASDB 10-U07669LM, March 1976. Remarks: Details of BACNOO SM-2 Model. No detailed analysis given; qualitative comments only.

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MARITIME D, AUG, 75	C	B	-	-	-	-	-	-	-
MORAN, SEPT, 76	-	-	-	C	-	C	-	-	-

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MARITIME D
AUG 75

"Mission Analysis Report for SES-100A Mission No. 101", Maritime Dynamics, RPT-1044-11, ASDB 10-U09078L, Aug. 1975. Remarks: Performance results of mission 101 of SES-100A for speed range of 35-56 knots in Sea State 1. Turning performance at 40 & 50 kts.

MORAN
SEPT 76

"Seakeeping Characteristics of a High Length-to-Beam Ratio Surface Effect Ship", by D.D. Moran, J.A. Fein, J.J. Ricci, Paper No. 76-862, AIAA, ASDB 10-U08532M, Sept. 1976. Remarks: The results of experiments concerned with vertical plane dynamics of a high length to beam ratio SES (XR-5) are presented.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
NAEC, JULY, 67	B	B	-	-	-	-	-	-	-
NAS, MAY, 72	-	-	-	-	C	-	-	-	-
NAVSEC, AUG, 75	-	-	-	-	B	-	-	B	-
" NOV, 75	C	C	C	C	C	C		C	C
NPS, 71	C	C	-	-	-	-	-	-	-
NPS, JUNE, 73	B	B	-	-	-	-	-	-	-
" JUNE, 73	C	C	-	-	-	-	-	-	-
" DEC, 73	-	C	-	-	C	C	-	-	-
" SEPT, 74	-	-	-	-	-	C	-	-	-
" DEC, 74	-	-	-	-	-	C	-	-	-
NPS, DEC, 74	-	B	-	-	-	-	-	-	-
" DEC, 75	-	-	-	-	-	B	-	-	-
" MAR, 76	-	-	-	-	-	B	-	-	-
" JUNE, 77	-	-	-	-	-	B	-	-	-
" JUNE, 77	-	-	-	-	-	C	-	-	-

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NAEC JULY 67	"XR-1A Captured Air Bubble Boat Interim Test Report No. 1", by W.A. Simmons, Naval Air Engineering Center, Philadelphia, ASDB 10-U03511L, July 1967.
NAS MAY 72	"Study of a Concept for a Surface Effect Ship ASW Aircraft Carrier (SES/CVS)", National Academy of Sciences, ASDB 10-U09364, May 1972. Remarks: Study of the feasibility of combining an SES with low take-off and landing speed aircraft in order to create an ASW aircraft carrier (CVS).
NAVSEC AUG 75	"Design Data Sheet-Stability and Buoyancy of U.S. Naval Surface Ships", Naval Ship Engineering Center, ASDB 10-U08459M, August 1975.
NAVSEC NOV 75	"Bibliography of Publications Sponsored by the Surface Effect Ships Project (PMS 304)", compiled by the Plans and Programs Division, SESPO, NAVSEC, Nov. 1975.
NPS 71	"Evaluation of the XR-3 Testcraft Annual Report", by D.M. Layton, Naval Postgraduate School, ASDB 10-U09397L, 1971. Remarks: Report describes modifications and repairs to XR-3 testcraft and subsequent testing.
NPS JUNE 73	"Turning Characteristics of the Bell 100 Ton Surface Effect Ship", by K.R. Myers, Naval Postgraduate School, (AD-767680/2), NTIS, Master's Thesis, June 1973, 145 p.
NPS JUNE 73	"Some Performance Characteristics of the Bell 100 Ton Surface Effect Ship", by L.F. Cagle, Naval Postgraduate School, ASDB 10-U05091M, (AD765689), June 1973.
NPS DEC 73	"XR-3 Surface Effects Ship Test Craft: A Mathematical Model and Simulation Program with Verification", by D.G. Leo and R. Boncal, Naval Postgraduate School, ASDB 10-U05187M, (AD772847), December 1973.
NPS SEPT 74	"Investigation of Methods to Optimize Captured Air Bubble Surface Effect Ship Digital Simulation for Irregular Sea Conditions", by W. R. Mitchell, Naval Postgraduate School, Master's Thesis, Sept. 1974, (ADA-001292/2GA), 52 p.
NPS DEC 74	"Study of Heave Acceleration/Velocity Control for the Surface Effect Ship", by U.S. Grant, Jr., Master's Thesis, Naval Postgraduate School, Dec. 1974, 222 p., (AD-A009 302/1GA).

NPS DEC 74 — "XR-3 Turning Performance", by James Harold Roberts, Master's Thesis, Naval Postgraduate School, Monterey,Calif, Dec. 1974.

NPS DEC 75 — "Study of the Roll and Pitch Transients in Calm Water Using the Simulated Performance of the XR-3 Surface Effect Ship Loads and Motions Computer Program", by Reinhard F. Menzel, Master's Thesis, Naval Postgraduate School, Monterey,Calif, Dec. 1975.

NPS MAR 76 — "The Effect of Rapid Raising of the Bow Seal on Early Transition of the XR-3 Captured Air Bubble Testcraft", by Wayne T. Moore, Master's Thesis, Naval Postgraduate School, March 1976.

NPS JUNE 77 — "Sensitivity Study of the XR-3 Loads and Motions Computer Program Sidewall Parameters and Forces on Roll Behavior in Calm Sea and a comparison to Testcraft Turn Maneuver Data", by Rolf-Guenther Riedel, Naval Postgraduate School, Master's Thesis, June 1977.

NPS JUNE 77 — "Investigation of a Linear, Two-Degree-of-Freedom Simulation of the XR-3 Captured Air Bubble (CAB) Craft in the Frequency Domain", by Lewis F. McIntyre, Master's Thesis, Naval Postgraduate School, June 1977.

AD-A083 568 BAND LAVIS AND ASSOCIATES INC SEVERNA PARK MD F/G 13/10
BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY --ETC(U)
APR 79 D R LAVIS, E G BAND, A W FOWLER DOT-CG-806510-A
UNCLASSIFIED 117-2 USCG-D-75-79 NL

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AD
A083 568

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
OCEANICS,	AUG, 71	-	-	-	-	-	B	-	-	-
"	DATE UNKNOWN	-	C	-	-	-	C	-	-	-
"	MAR, 73	-	-	B	-	B	-	-	-	-
"	MAY, 73	-	-	B	B	B	B	-	-	-
"	JUNE, 73	-	-	-	-	-	C	-	-	-
OCEANICS,	JUNE, 73	-	-	-	-	-	C	-	-	-
"	JUNE, 73	-	-	-	-	-	C	-	-	-
"	JUNE, 73	-	-	-	-	-	C	-	-	-
"	MAY, 74	C	C	C	C	C	C	-	C	-
"	DATE UNKNOWN	-	-	-	-	-	C	-	-	-
OCEANICS,	MAY, 74	-	-	-	-	C	-	-	-	-
"	MAY, 74	-	C	-	C	-	C	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

OCEANICS AUG 71	"A Study of Surface Effect Ship (SES) Craft Loads & Motions Part IV-System Identification of SES Dynamics & Parameters", by P. Kaplan and T.P. Sargent, RPT-81-84D, ASDB 10-U09396L, August 1971. Remarks: The determination of stability derivatives appropriate to the vertical plane motion of an SES craft is carried out by system identification.
OCEANICS	"Correlation & Verification of Computer Simulation for Full Scale Motions of SES Loads & Motions Studies", by J. Bentson, P. Kaplan, Oceanics, Inc., RPT-74-107A, ASDB 10-U09486L. Remarks: Correlation between prediction from the Oceanics 6-DOF motions simulation and SES-100B full scale data.
OCEANICS MAR 73	"Aero/Hydrodynamic Design Manual Preparation Notebook", Oceanics, Inc., ASDB 10-U09222L, March 1973. Remarks: This document compiles references on aero/hydrodynamic technology applicable to SES design.
OCEANICS MAY 73	"Experimental Study of SES Craft Lateral Hydrodynamic Forces and Moments", by P. Kaplan, Oceanics, Inc., RPT-73/97, ASDB 10-U09244L, May 1973. Remarks: Report presents experimental data on SES lateral dynamic forces and moments; outlines available theoretical formulations for these.
OCEANICS JUNE 73	"Advanced Loads and Motions Studies for Surface Effect Ship (SES) Craft, Part IV- Motion and Load Characteristics of Multi-Thousand Ton SES Craft", by P. Kaplan and J. Bentson, Oceanics, inc., RPT-73-970, ASDB 10-U09257. Remarks: Discussion of results obtained from motion studies with parametric variations of a multi-thousand ton SES. June 1973.
OCEANICS JUNE 73	"Advanced Loads & Motions for Surface Effect Ship (SES) Craft Part VI, Accumulator Control for Heave Acceleration Reduction", by P. Kaplan, T.P. Sargent, P.S. Bono, Oceanics, Inc., ASDB 10-U09258, June 1973. Remarks: Mathematical computer model to determine the performance of an SES craft when equipped with an accumulator system.
OCEANICS JUNE 73	"Advanced Loads and Motions for Surface Effect Ship (SES) Craft Part II - Analog Computer Simulation", by M.N. Silbert and P. Kaplan, Oceanics, Inc., RPT-73-978, ASDB 10-U09253L, June 1973. Remarks: Report presents analog computer simulation of SES vertical plane motions including seal dynamics.

OCEANICS
JUNE 73

"Advanced Loads and motions Studies for Surface Effect Ship (SES) Craft Part III-The Effect of Fan Dynamics on SES Craft Motions", by Jesse Schneider, Oceanics, Inc., RPT-73-97C, ASDB 10-U09255L, June, 1973. Description of the analysis, and the results obtained via computer simulation when considering fan dynamics effects on craft motions.

OCEANICS
MAY 74

"Lateral Dynamics of Sidewall SES Craft", by P. Kaplan and S. Davis, Oceanics Inc., Hovering Craft and Hydrofoil Conf., May 13-16, 1974, p. 49-56. Published by Kalerghi Publishing, London, England, 1974.

OCEANICS
MAY 74

"Surface Effect Ships Aero/Hydrodynamics Technology Design Manual, Vol. 1, Introduction and Summary Design", Oceanics, Inc., ASDB 10-U07894LM, (ADB004138), May 1974. Remarks: Part I of a series of SES design manuals; ref. vol's I to IV.

OCEANICS

"Extended Control System Analysis for 2000 Tone SES Craft" by J. Schneider, P. Kaplan, M.N. Silbert, Oceanics, Inc., RPT-74-107B, ASDB 10-U09488L. Remarks: This report presents results of an analytical study, combined with computer simulation, for various types of control systems for heave alleviation for SES craft.

OCEANICS
MAY 74

"Surface Effect Ships Aero/Hydrodynamics Technology Design Manual, Vol. II, Design Criteria, Range, Drag, and Components", Oceanics, Inc., ASDB 10-U07895LM, (ADB004139), May 1974. Remarks: Part II of a series of SES design manuals; ref. vol's I, III & Iv.

OCEANICS
MAY 74

"Surface Effect Ships Aero/Hydrodynamics Technology Design Manual, Vol. III, Dynamic Performance", Oceanics, Inc., ASDB 10-U07896LM, (ADB004140, May 1974. Remarks: Part III of a series of SES Design Manuals; ref. vol's I, II, IV.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
PALERMO U. OCT, 75	-	-	B	-	B	-	-	C	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

PALERMO U
OCT 75

"A Parametric Study of the Directional Stability of Side-Wall Type Air Cushioned Vehicles", by A. Magazzu, Palermo University, Palermo, Italy, Italian Association of Aeronautics and Astronautics, National Congress, 3rd, September 30-October 3, 1975, Vol. 1, Oct. 1975. In Italian.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
RALEY,	SEPT, 76	C	C	-	-	-	-	-	-	-
ROHR,	OCT, 72	C	C	-	-	-	-	-	-	-
" ,	DEC, 72	C	C	-	-	C	C	-	-	-
" ,	DEC, 72	C	-	-	-	-	-	-	-	-
" ,	DEC, 73	-	-	C	-	-	-	-	-	-
ROHR,	JAN, 74	-	-	B	B	-	-	-	-	-
"	FEB, 74	B	B	-	-	-	-	-	-	-
"	JAN, 74	-	-	-	-	-	C	-	-	-
"	JAN, 74	-	-	-	-	-	-	-	C	-
"	MAY, 75	C	C	-	-	-	-	-	-	-
ROHR,	AUG, 75	-	-	-	-	-	C	-	C	-
"	OCT, 75	-	-	B	B	B	B	-	-	-
"	NOV, 75	-	-	B	-	B	-	-	-	-
"	DEC, 75	-	-	-	-	-	C	-	C	-
"	JAN, 76	-	-	-	C	-	C	-	C	-
ROHR,	FEB, 76	-	-	-	-	-	C	-	C	-
"	MAR, 76	C	C	-	-	-	-	-	-	-
"	AUG, 78	-	-	A	A	A	A	-	A	-
ROSENBLATT,	FEB, 73	-	-	-	-	C	C	-	-	-
"	JUNE, 75	-	-	-	-	C	C	-	-	-

A = 1st Class Material, Important to Program

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B = Supporting Material

RALEY SEPT 76 — "Test and Evaluation of U.S. Navy 100 Ton Surface Effect Ships" by Carl Raley and Fred Wilson, AIAA/SNAME Advanced Marine Vehicles Conference, Sept. 1976, Paper No. 76-860.

ROHR OCT 72 — "R & D Testcraft--XR-1B Semi-Flush Inlets FY-72 Final Test Report", by F.F. Burke, N.L. Wener, P.R. Shipps, RHR-72-941, Rohr Corporation, ASDB 10-U02551LM, October 1972. Remarks: Presents test craft data regarding waterjet propulsion performance; describes objectives and tests. Presents results without comparative evaluation or correlation.

ROHR DEC 72 — "R & D Testcraft--XR-1B Semi-Flush Inlets FY-72 Correlation Report", by F.P. Burke, N.L. Wener, P.R. Shipps, Rohr Corporation, RHR-72-642, ASDB 10-U02543LM, Dec. 1972.

ROHR DEC 72 — "R & D Testcraft-XR-1C, Design Report (Draft)", by K. Abe, N.L. Wener, C.S. Horine, Rohr Corporation, AMS-865-005, ASDB 10-U 09372L, Dec. 1972. Remarks: Description of the Rohr Industries XR-1C Craft design. Includes conceptual design of flexible seals, fan and ducting system, seal installation and translation.

ROHR DEC 73 — "Hydrodynamic Test Program CDRL No. A003", Rohr Corporation, ASDB 10-U09347L, Dec. 1973. Remarks: Drag data is presented based on tow tank tests of a 1/28th scale model of the Rohr 2KSES.

ROHR JAN 74 — "Hydrodynamic Test Programs CDRL No. A003", Rohr Corporation, ASDB 10-U09115L, Jan. 1974. Remarks: Drag test results for Rohr 2KSES are presented; methods for improving stability in the roll-yaw coupling mode and for reducing risk in a future mode are discussed.

ROHR FEB 74 — "Surface Effect Ship Research with the XR-1 Test Craft", by F.P. Burke and N.L. Wener, AIAA Paper No. 74-313, Feb. 25, 1974.

ROHR JAN 74 — "2000 Ton Surface Effect Ship, Task Order No. 0002, Contract Item No. 0003", Rohr Corporation, ASDB 10-U09145L, April 1974. Remarks: Study of the Rohr 6-DOF time-domain and the Oceanic computer programs to relate motion results to probability, frequency and intensity of slamming loads.

ROHR JAN 74 — "Operator Control Tests and Analysis-Final Report", Rohr Corp., ASDB 10-U09168L, June 1974. Remarks: Study investigates the effects of vertical (two-axis) vibration on the performance of personnel exposed to vibrations from .01 HZ to 20.0 HZ.

ROHR MAY 75	"R & D Testcraft-XR-1C Flush Inlets and Seals-Final Correlation Report", by G. Clary, G. Freske, Rohr Corp., RHR-74-505A, ASDB 10-U09065L, May 1975.
ROHR 25 AUG 75	"Structural Design Loads Summary Report", Vol. 1, CDRL No. S007 (H-11)B, 25 August 1975.
ROHR 31 OCT 75	"Preliminary Stability and Control Report", CDRL No. SOOA(Z-3), Rohr Industries, 31 Oct. 1975.
ROHR 18 NOV 75	"Stabilizer Design Disclosure Report", CDRL No. S006 (M-3), Rohr Industries, 18 Nov. 1975.
ROHR 23 DEC 75	"Loads Criteria Loads and Motions Computer Description Report", CDRL No. SOOM(H-10)A/B, Rohr Industries, 23 Dec. 1975.
ROHR 31 JAN 76	"Loads Criteria Model Tests Test Data Analysis and Correlation Report", Appendix A, CDRL No. SOOG(H-10)A, Rohr Industries, 31 Jan. 1976.
ROHR 27 FEB 76	"Criteria Applications and Structural Design Criteria Final Summary Report:, Vol. III, CDRL No. S007(H-11)A, Rohr Industries, 27 Feb. 1976.
ROHR MAR 76	"XR-1D Test Report (1 September thru 17 November 1975), Vol. I", by G. Clary, J. Morris, W. Citinger, Rohr Corporation, RHR-76-100A, ASDB 10-U09008L, March 1976. Remarks: Report covers further tests of XR-1D Testcraft ride control system, seals, lift system propulsion system and craft performance.
ROHR 31 AUG 78	"Stability & Maneuverability Report", E.H. Price, R.C. Stoner, N.L. Wener, Rohr Marine, Inc., Rept. No. TTP00013A, 31 Aug. 1978.
ROSENBLATT FEB 73	"Conceptual Design Handbook for Surface Effect Ships", (draft copy), Rosenblatt (M.)and Son, Inc., ASDB 10-U09218, Feb. 1973. Remarks: This is a manual to be used in conceptual design of surface effect ships covering topics in performance, configuration and propulsion.
ROSENBLATT JUNE 75	"Surface Effect Ship, Advanced Design and Technology", Rosenblatt (M.) and Son, Inc., ASDB 10-U07950LM,(ADB004314),June 1975. Remarks: Part of a series of SES design manuals.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
SESPO,	JUNE,	68	-	-	-	-	-	-	-	B	-
"	AUG,	75	-	-	-	-	-	-	-	B	-
"	AUG,	75	-	-	-	-	-	-	-	B	-
"	SEPT,	75	-	-	-	-	-	-	-	B	-
SIT,	DEC,	69	-	-	C	C	-	-	-	-	-
SIT,	DEC,	69	-	-	B	B	-	-	-	-	-
"	JAN,	72	-	-	-	B	-	-	-	-	-
"	FEB,	73	-	-	B	B	-	-	-	-	-
"	DEC,	73	-	-	B	B	-	-	-	-	-
"	JUNE,	74	-	-	B	B	-	-	-	-	-
"	OCT,	75	-	-	B	B	-	-	-	-	-
SKOLNICK,	APR,	74	-	-	-	-	-	-	-	B	-
SNAME,	MAY,	67	-	-	C	C	-	-	-	-	-
STI,	MAR,	74	-	-	-	-	-	-	-	B	-
"	JUNE,	75	-	-	-	-	-	-	-	B	-
"	SEPT,	75	-	-	-	-	-	-	-	B	-
STI,	FEB,	76	-	-	-	-	-	-	-	B	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

SESPO JUNE 68	"Specification Seakeeping and Handling Qualities of Surface Effect Ships", Surface Effect Ships Project Office, JSESPO Specification No. SES-HQ-1, ASDB 10-U09427, June 1968. Remarks: Early set of general specifications for seakeeping for a general SES.
SESPO AUG 75	"Approach to High Speed Ship Ride Quality Simulation", by W.L. Malone, J.M. Vickey, Surface Effect Ships Project, ASDB 10-U 09074, August 1975. Remarks: This paper discusses the simulation of motions and human tolerance to motion for the case of SES craft.
SESPO AUG 75	"Simulation as a Design and for Ride Control Systems", by C.J. Boyd, W.L. Malone, J.M. Vickery, Surface Effect Ships Project, ASDB 10-U09081, August 1975. Remarks: This paper discusses the simulation of motions and human tolerance to motion for the case of SES craft.
SESPO SEPT 75	"Applied Physics Laboratory Notes on Ride Quality Integrals", Surface Effect Ships Project, ASDB 10-U09083, Sept. 1975. Remarks: These notes present data in accelerations and motion tolerance for a 2KSES craft.
SIT DEC 69	"Tests of the NSRDC 1/7-scale XR-1B Surface Effect Ship Model with Ram and Flush Waterjet Propulsion Inlets", by R.L. Van Dyck, Stevens Institute of Technology, SIT-DL-69-1417, ASDB 10-U09561L, Dec. 1969.
SIT DEC 69	"Further Tests of a 1/7-Scale XR-1B Surface Effect Ship Model with Ventral Fins", by R.L. Van Dyck, SIT-DL-69-1440, ASDB 10-U09563L, Dec. 1969.
SIT JAN 72	"Tests on a Partial Length Sidewall SES Model in Regular and Irregular Waves", by G. Fridsma, SIT-DL-72-1576, January 1972.
SIT FEB 73	"Performance & Stability Tests of XR-1B SES Model", by P.W. Brown, W. Klosinski, Stevens Institute of Technology, SIT-DL-73-1619, ASDB 10-U09220L, Feb. 1973. Remarks: This report presents the results of towing tank tests conducted on a model of the XR-1B bow to measure resistance and lateral plane motions.
SIT DEC 73	"Stability and Seakeeping Tests of B-28 Model 2KSES", by R. Van Dyck, Stevens Insti. of Technology, DL-73-1712, ASDB 10-U09354L, December 1973. Remarks: Report and data on static stability and resistance in calm water; mean resistance, dynamic response characteristics and habitability in waves for Bell Aeros ace Model B-28 of 2KSES.

SIT JUNE 74	"Performance, Stability and Seakeeping Characteristics of a Model of the 100-B SES Test Craft. Part I: Performance and Stability Characteristics", by G. Fridsma, Stevens Institute of Technology, SIT-DL-74-1673, (ADB007610), ASDB 10-U09457LF, June 1974.
SIT OCT 75	"Performance, Stabili:y and Seakeeping Characteristics of a Model of the 100-B SES Testcraft; Part 3: Stability Characteristics at High Flow Rates", by J. Adams, Stevens Inst. of Tech., SIT-DL-75-1786, ASDB 10-U09093L, Oct. 1975. Remarks: Report and data on stability characteristics at high flow rates for 1/10-53 scale model of SES-100B.
SIT OCT 75	"Stability and Performance ts of SES-100A Model with Modified Sidewalls and Various Size Stern Fins:, by R. Van Dyck, Stevens Insti. of Tech., SIT-DL-75-1784, Oct. 1975. Remarks: Report and data on service of calm water, constant speed tests of 1/12 scale model of SES-100A with modified flush inlet sidewalls and various appendages.
SKOLNICK APR 74	"Crew Performance Requirements in the Vibration Environments of Surface Effect Ships", by A. Skolnick, ASDB 10-U09153, April 1974. Remarks: This paper was presented at the Aerospace Medical Panel at the Norwegian Eng. Society. The material presented in this paper is a compilation of material previously presented.
SNAME MAY 67	"Captured Air Bubble Vehicle Stability Tests", by R.A. Wilson, AIAA/SNAME Advanced Marine Vehicle Meeting, Norfolk, VA, May 22-24, 1967, Paper No. 67-349.
STI MAR 74	"Surface Effect Ship Habitability Simulation (Final Report)", by W.F. Clement, J.J. Shanahan, Systems Technology, Inc., ASDB 10-U05290LM, (AD920121L), March 1974. Remarks: Results from habitability simulation at the MSFC, Huntsville 6 DOF Motion Base.
STI JUNE 75	"Effects of Simulated Ships Motion on Crew Operations in a Surface Effect Ship:, Systems Technology, Inc., ASDB 10-U09066, June 1975. Remarks: This report summarizes the results of tests conducted on humans in order to establish ride quality criteria for surface effect ships.
STI SEPT 75	"Effects of Simulated Rough Water Operations on Crew Operations in a Large Surface Effect Ship", by P.P. Jey, R.W. Humes, J.R. Hogge, Systems Technology, Inc., RPT-1057-2, ASDB 10-U09085, Sept 1975. Remarks: Results of motions simulations on SESTF Crewmen to study human tolerance to motion on SES craft.

STI
FEB 76

"Simulated Rough Water Operations During Long Cruises in a 2000 Ton Surface Effect Ship Phases I & IA", by H.R. Jex, J.E. O'Hanlon, C.L. Ewing, Systems Technology, Inc., STI-1057-2, ASDB 10-U07287LM, (ADB009519), Feb. 1976. Remarks: SES-like motion environment simulated on a motion-generator test device exposing crewmen for 30 minutes to 2 days.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
WALDO,	MAY, 67	-	-	-	-	C	C	-	-	-
WILSON,M.B.	SEPT, 76	-	-	-	-	B	B	-	-	-
WOOLLEY,	JULY, 67	C	C	C	C	-	-	-	-	-

A = 1st Class Material, Important to Program

B = Supporting Material

C = Useful but Nonessential to Program

WALDO MAY 67	"Some Special Problems in Surface Effect Ships", (SNAME/AIAA), by R. Waldo, May 1967. Report number unknown.
WILSON, M.B. SEPT 76	"Interference Effects on Lateral Forces and Moments on High L/B SES Arrangements", by M.B. Wilson, SNAME/AIAA, Paper No.76-859, ASDB 10-U08654F, Sept. 1976. Remarks: General mathematical representation using slender wing theory are presented for prediction of interference effects.
WOOLLEY JULY 67	"Sidewall Progress at Southampton", by D. Woolley, Air Cushion Vehilces (Suppl. to Flight), Vol. 10, July 1967, pp 8-9.

BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY SUPPORTED CRAFT

VOLUME IV

A CATEGORIZED BIBLIOGRAPHY OF HYDROFOIL CRAFT STABILITY RELATED REPORTS

by

David R. Lavis
Edward G.U. Band
Alexander W. Fowler
Edgar D. Hoyt

Task 1 Report
Contract No. DOT-CG-806510-A

for

U. S. Department of Transportation
United States Coast Guard
Office of Research and Development
Washington, D. C. 20590

INTRODUCTION

This document contains a general bibliography of Hydrofoil Craft stability related reports. It is one of a series of bibliographies which have been prepared for the United States Coast Guard's (USCG's) investigation of the stability of dynamically supported craft. The other bibliographies in this series are:

- A Bibliography of Amphibious Air Cushion Vehicle (ACV) Stability Related Reports.
- A Bibliography of Rigid Sidehull Surface Effect Ship (SES) Stability Related Reports.
- A Bibliography of Planing Craft Stability Related Reports.
- A General Bibliography of Ship and Small Craft Stability Related Reports.

Entries in the bibliography have been made in alphabetical order using the Author's company (or affiliation) or Author's last name if his company and affiliation are unknown or are less descriptive of the source.

A "Reference Evaluation and Subject Index" table is provided for each group of alphabetical entries. These tables provide an indication of the relevance or value of each document to the study of craft stability and also places each within one of nine separate subject categories. The value of each document to the subject of craft stability has been indicated by assigning a letter A, B. or C to each entry using the following classification.

A: First Class Material, Important to Program

B: Supporting Material

C: Useful but not Essential to Program

The subjects into which each document has been categorized are defined as follows:-

Full Scale Operations, Static

Report contains full scale information of a non-dynamic nature, e.g. static stability testing, (craft stationary and/or at forward speeds) and/or general steady state operational behavior, including operators overall assessments.

Full Scale Operations, Dynamic

Report contains full scale information on craft dynamic behavior, e.g. seakeeping, maneuvering, response transients, dynamic stability, or dynamic behavior in general including operators overall assessments.

Model Tests, Static

Report contains model test information of a non-dynamic nature, e.g. craft and component static stability testing (model stationary and/or at forward speeds), calm water resistance tests, including test results and/or descriptions of test techniques.

Model Tests, Dynamic

Report contains test information on model dynamic behavior, e.g. towing tank or free (maneuvering) model dynamic tests, dynamic transient tests, seakeeping including surf tests, results and/or description of test techniques.

Analytical Studies, Static

Report contains analytical studies related to craft static stability.

Analytical Studies, Dynamic

Report contains analytical studies related to craft dynamic stability, e.g. analyses of craft capsizing, seakeeping, maneuvering, motion response, acceleration response, hull slamming, survivability.

Accident Reports

Report contains a specific account of, comment on, or analysis of a craft stability related accident which has resulted in property damage, personal injury or loss of life.

Criteria

Report contains information on craft stability related criteria, e.g. specific criteria or standards, design guidelines or practices for adequate craft stability, human tolerance to craft motions, safety limits, regulatory issues and standards.

Environment

Report contains information concerning weather conditions, e.g. wind, sea state, icing etc. Report may also contain information on forcast and hindcast techniques, and probabilistic description of severity.

The bibliography has been compiled from a fairly comprehensive search of the following sources.

1. The National Technical Information Service (NTIS)
2. The Royal Institution of Naval Architects (RINA)
3. Society of Naval Architects & Marine Engineers (SNAME)
4. North Carolina Science & Technology Research Center
5. U.S. Naval Academy Library
6. David W. Taylor Naval Ship Research & Development Center (DTNSRDC)

7. American Institute of Aeronautics & Astronautics (AIAA)
8. American Society of Mechanical Engineers (ASME)
9. U.S. Department of Transportation (DOT)
10. Engineering Index Inc. New York, N.Y.
11. Maritime Research Information Service (MRIS)
12. The British Ship Research Association (BSRA)
13. National Aeronautics & Space Administration (NASA)
14. Hovering Craft & Hydrofoil, Kalergi Publications
15. Robert Trillo Ltd. Hampshire, U.K.
16. Band, Lavis & Associates, Inc., Severna Park, MD.

GLOSSARY

*	An asterisk in the Reference Evaluation and Subject Index identifies reports which refer to Surface Piercing Hydrofoils, or to both Surface Piercing and Fully Submerged Systems.
AGC	Aerojet General Corporation
BAKER	Baker Manufacturing Company
BARRINGER	Barringer Research, Ltd.
BATH IRON	Bath Iron Works
BILES	J.H. Biles and Company, Ltd.
BOEING	Boeing Co.
BOWLES	Bowles Engineering Corporation
CARL	Carl (John H.) and Sons, Inc.
CD	Control Data Corp.
CFH	Canadian Forces Headquarters
CNA	Center for Naval Analyses
CORNELL	Cornell Aeronautical Laboratory, Inc.
DAC	Dehavilland Aircraft of Canada, Ltd.
DDC	Defense Documentation Center
DRBC	Defence Research Board, Canada
DREA	Defence Research Establishment, Atlantic
DTNSRDC	David W. Taylor Naval Ship Research & Development Center
EDO	EDO Corporation
FMO	FMO Corporation
GD	General Dynamics
GIANOTTI	Gianotti and Buck Associates, Inc.
GIBBS	Gibbs and Cox Inc.
GRUEN	Gruen Applied Science Laboratory, Inc.
GRUMMAN	Grumman Aerospace Corp.
HENDY	Hendy (Joshua) Corp.
HUGHES	Hughes Aircraft Co.
HYDRO	Hydronautics, Inc.
LMSC	Lockheed Missiles and Space Co.
MARAD	Maritime Administration, Dept of Commerce
MIAMI SC	Miami Shipbuilding Corp.
MINN U	University of Minnesota
MIT	Massachusetts Institute of Technology
MITSUBISHI	Mitsubishi Shipbuilding and Engineering Co., Ltd.
NACA	(prelude to NASA)
NASA	National Aeronautics and Space Administration
NAVSEC	Naval Ship Engineering Center
NISC	Naval Intelligence Support Center
NSMS	Naval Ship Missile Systems Engineering Station
NSSC	Naval Sea Systems Command
NTDC	Naval Training Device Center
NTS	Naval Torpedo Station
NUC	Naval Undersea Center

OCEANICS	Oceanics, Inc.
OTEF	Operational Test and Evaluation Force
RCA	Radio Corp. of America
ROCKWELL	Rockwell International Corp.
RTI	Robert Taggart, Inc.
SIT	Stevens Institute of Technology
SNAME	Society of Naval Architects and Marine Engineers
SPC	Sperry Piedmont Co.
SRI	Southwest Research Institute
SSR	Shipbuilding and Shipping Record
SUPRAMAR	Supramar, Ltd.
USCG	United States Coast Guard
USMMA	United States Merchant Marine Academy

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
AEROSPATIALE, NOV, 74		B			B		B		
" MAY, 75		C				B			
" DEC, 75		B			B		B		
AGC , JAN, 72	NOT AVAILABLE IN TIME FOR REVIEW								

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

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BAKER, APR, 52	-	-	-	-	-	A	-	B	-
BATH IRON, 54 *	-	-	B	-	B	-	-	B	-
" " 54 *	-	-	B	-	B	-	-	B	-
BILES, NOV, 77 *	-	-	-	-	-	-	-	A	-
BOEING,	B	B	-	-	-	-	-	-	-
BOEING, OCT, 62	-	B	-	-	-	-	-	-	-
" AUG, 63	-	A	-	-	-	A	A	-	-
" JAN, 64	-	-	-	-	C	-	-	-	-
" FEB, 64	-	-	-	-	B	-	-	B	-
" JULY, 64	-	B	-	-	-	-	-	-	C
BOEING, SEPT, 64	-	B	-	-	-	-	-	-	C
" MAR, 65	-	C	-	-	-	-	-	C	-
" AUG, 65	-	-	-	-	-	C	-	C	-
" NOV, 65	-	C	-	-	-	C	-	-	-
" AUG, 66	-	-	-	-	-	B	-	B	-
BOEING, NOV, 66	C	-	-	-	-	-	-	-	-
" JAN, 67	B	-	-	-	-	-	-	-	B
" MAY, 67	C	-	-	-	-	-	-	-	-
" JULY, 67 (a)	B	-	-	-	-	-	-	-	B
" JULY, 67 (b)	C	-	-	-	-	-	-	-	-

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BOEING, SEPT, 67	-	-	-	-	-	C	-	-	-
" DEC, 67	-	C	-	-	-	-	-	C	-
" JAN, 68	-	-	-	-	-	A	-	C	-
" FEB, 68(a)	-	-	-	-	-	C	-	-	-
" FEB, 68(b)	-	C	-	-	-	C	-	-	-
BOEING, MAR, 68(a)	-	-	-	-	-	C	-	-	-
" MAR, 68(b)	-	B	-	B	-	B	-	-	-
" APR, 68	-	C	-	-	-	-	-	-	-
" MAY, 68(a)	-	-	-	-	-	C	-	-	-
" MAY, 68(b)	-	-	-	-	-	C	-	-	-
BOEING, JULY, 68	-	-	-	-	-	C	-	-	-
" NOV, 68	-	-	-	-	-	C	-	-	-
" DEC, 68	-	-	-	-	-	C	-	-	-
" FEB, 69	-	-	-	-	C	-	-	-	-
" MAY, 69(a)	-	-	-	-	-	C	-	-	-
BOEING, MAY, 69(b)	-	-	-	-	C	-	-	-	-
" SEPT, 69(a)	-	B	-	-	-	-	-	-	B
" SEPT, 69(b)	B	-	-	-	-	-	-	-	-
" MAR, 70	-	B	-	-	-	B	-	-	-
" JUNE, 70	-	C	-	-	-	-	-	-	-

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BOEING,	JULY, 70	-	-	-	-	-	B	-	-	-
"	MAR, 71	-	-	-	-	-	A	-	B	-
"	JULY, 71	-	-	-	-	-	B	-	-	-
"	AUG, 71	-	-	-	-	-	C	-	-	-
"	NOV, 71	-	C	-	-	-	-	-	-	-
BOEING,	DEC, 71	-	-	-	-	-	B	-	-	-
"	JAN, 72	-	-	-	-	-	B	-	-	-
"	JUNE, 72(a)	-	-	-	-	-	B	-	B	-
"	JUNE, 72(b)	-	-	-	-	-	B	-	B	-
"	SEPT, 72	-	-	-	-	B	-	-	-	-
BOEING,	DEC, 72	-	-	-	-	-	B	-	A	-
"	APR, 73(a)	-	-	-	-	-	B	-	-	-
"	APR, 73(b)	-	-	-	-	-	C	-	-	-
"	JUNE, 73	-	-	-	-	-	C	-	-	-
"	JAN, 74	-	-	-	-	-	C	-	-	-
BOEING,	FEB, 74(a)	-	-	-	-	-	B	-	-	-
"	FEB, 74(b)	-	C	-	-	-	-	-	-	-
"	FEB, 74(c)	-	-	-	-	C	C	-	-	-
"	74	-	-	-	-	C	C	-	C	-
"	JUNE, 74	-	-	-	-	-	C	-	C	-

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BOEING,	JUNE,	75(a)	-	C	-	-	-	-	-	-	-
"	JUNE,	75(b)	-	C	-	-	-	-	-	-	-
"	AUG,	75	-	C	-	-	-	-	-	-	-
"	MAY,	76(a)	-	C	-	-	-	-	-	-	-
"	MAY,	76(b)	-	C	-	-	-	-	-	-	-
BOEING,	JUNE,	76	-	C	-	-	-	C	-	-	-
"	MAR,	77(a)	-	-	-	-	-	C	-	-	-
"	MAR,	77(b)	-	-	-	-	-	C	-	-	-
"	MAR,	77(c)	-	-	-	-	-	A	-	A	A
"	MAR,	77(d)	-	-	-	-	-	A	-	A	A
BOEING,	APR,	77(a)	-	-	-	-	-	C	-	-	-
"	APR,	77(b)	-	-	-	-	-	C	-	-	-
"	OCT,	77(a)	-	C	-	-	-	C	-	-	-
"	OCT,	77(b)	-	-	-	-	-	C	-	-	-
BOWLES			-	-	-	-	-	C	-	-	-

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AUG 65 — "Performance Criteria and Test Report", by W.E. Farris, Boeing Co., ASDB 10-U01633, August 1965.

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NOV 65 — "Correlation Between Actual Craft Turning Performance and Turning and Analysis of PCH-1", by R.M. Hubbard, ASDB 10-U08296F, Boeing Co., November 1965.

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AUG 66 — "PCH-1 MOD 1 Design Study Phase A - Technical Report", Boeing Co., ASDB 10-C00080M, August 1966.

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BOEING
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MAY 69(a)
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"	APR,	49	-	C	-	-	-	-	-	-	-
"	OCT,	49	-	C	-	-	-	-	-	-	-
"	FEB,	50	-	-	-	C	-	-	-	-	-
CD,	JULY,	61	-	-	-	-	-	B	-	-	-
CD,	JUNE,	62	-	-	-	-	-	B	-	-	-
CFH,	MAR,	72*	-	B	-	-	-	-	-	-	-
CHISTIAKOV,		74	-	-	-	-	-	C	-	-	-
CNA,	MAR,	73	-	C	-	-	-	-	-	-	C
CORNELL,	SEPT,	62	-	-	-	C	-	-	-	-	-
CORNELL,	MAY,	64	-	-	-	C	-	-	-	-	-
"		65(a)	-	-	-	-	-	C	-	-	-
"		65(b)	-	-	-	-	-	C	-	-	-
"		65(c)	-	-	-	-	-	C	-	-	-
"	MAY,	65	-	-	-	-	-	C	-	C	-
CORNELL,	SEPT,	65	-	-	-	-	-	C	-	-	-
"	OCT,	65	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

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REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
DAC,	DEC,	61 *	-	-	-	-	-	C	-	-	-
"	OCT,	62(a) *	-	-	-	-	-	B	-	-	-
"	OCT,	62(b) *	-	-	-	-	-	C	-	-	-
"	FEB,	65 *	-	-	-	-	-	B	-	-	-
"	NOV,	68 *	-	-	-	-	-	A	-	-	-
DAC,	MAY,	69 *	-	-	-	-	-	B	-	-	-
DEWITT,	MAY,	71 *	-	-	-	-	C	-	-	-	-
DRBC,	JUNE,	57 *	-	B	-	-	-	-	-	-	-
DREA,	APR,	69 *	-	-	-	-	-	B	-	-	-
"	MAR,	71 *	-	C	-	-	-	A	-	-	-
DREA,	APR,	71 *	-	C	-	-	-	C	-	-	-
"	MAY,	71 *	-	-	-	-	C	C	-	-	-
"	APR,	72 *	-	-	-	-	-	B	-	A	-
"	JUL,	72 *	-	C	-	-	-	C	-	-	-
"	AUG,	72 *	-	C	-	-	-	A	-	-	-
DREA,	SEPT,	72 *	-	B	-	-	-	B	B	-	-
"	APR,	73 *	-	-	-	-	-	B	-	-	-
"	JAN,	74 *	-	-	-	-	-	C	-	-	-
"	JUNE,	74	-	-	-	-	-	C	-	-	-
"	JULY,	75(a)	-	-	-	-	-	-	-	B	-

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REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
DREA,	JULY,	75(b)	NOT AVAILABLE								
"	SEPT,	76 *	-	-	-	-	-	C	-	-	-
DTNSRDC,	DEC,	54	-	-	-	-	-	C	-	-	-
"	NOV,	58	-	-	-	-	-	C	-	-	-
"	MAR,	61	-	-	C	-	-	-	-	-	-
DTNSRDC,	MAY,	68	-	C	-	-	-	-	-	-	-
"	JAN,	69	-	C	-	-	-	-	-	-	-
"	FEB,	69	-	C	-	-	-	-	-	-	-
"	MAY,	69(a)	-	C	-	-	-	-	-	-	-
"	MAY,	69(b)	-	-	C	-	-	-	-	-	-
DTNSRDC,	NOV,	69	-	-	-	-	-	C	-	-	-
"	JAN,	70	-	B	-	-	-	-	-	-	-
"	JULY,	71	-	-	C	B	-	-	-	-	-
"	NOV,	73	-	-	-	-	-	B	-	-	-
"	FEB,	74(a)	-	-	-	-	-	B	-	-	-
DTNSRDC,	FEB,	74(b)	-	-	-	-	-	C	-	-	-
"	FEB,	74(c)	-	-	-	-	-	C	-	-	-
"	FEB,	74(d)	-	-	-	-	C	-	-	-	-
"	APR,	74(a)	-	-	-	-	-	C	-	-	-
"	APR,	74(b)	-	-	-	-	-	C	-	-	-

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REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE				FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
DTNSRDC,	NOV,	74		-	-	C	-	-	-	-	-	-
"	APR,	75		-	-	C	-	-	-	-	-	-
"	NOV,	75		-	-	-	-	-	B	-	-	-
"	DEC,	75		-	-	-	C	-	-	-	-	-
"	JAN,	76		-	-	-	-	-	C	-	-	-
DTNSRDC,	APR,	76		-	C	-	-	-	-	-	-	-
"	JUNE,	76	*	-	-	-	-	B	B	-	-	-
"	JULY,	76		-	-	-	-	-	C	-	-	-
"	SEPT,	76		-	-	-	-	-	B	-	-	-
"	MAY,	77		-	-	-	-	C	-	-	-	-
DTNSRDC,	APR,	78		-	-	-	-	C	-	-	-	-

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DAC OCT 62(b) — "Design Study 180 Ton ASW Hydrofoil Ship Vol. IV Technical Reports Phase II Study", Dehavilland Aricraft Canada, Ltd., ASDB 10-C00503M, Oct. 1962.

DAC FEB 65 — "FHE 400 Phase IV Stability Study", Dehavilland Aircraft of Canada, Ltd., ASDB 10-C00179M, Feb. 1965.

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DAC MAY 69 — "Problems and Prospects of the Superventilated Hydrofoil", by B.V. Davis, draft of paper, Dehavilland Aircraft of Canada, Ltd., ASDB 10-U00078M, May 1969.

DEWITT MAY 71 — "A Geometric and Hydrodynamic Comparison Between Fully Submerged and Surface Piercing Hydrofoil Systems", by H. DeWitt, Hovering Craft and Hydrofoil, V.10 N8, May 1971, pp 22-31.

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DREA APR 69 — "FHE-400 Steady State Performance and Calm Water Stability Predictions", by R.T. Schmitke, ASDB 10-C00171M, Defence Research Establishment, Atlantic, April 1969.

DREA MAR 71 — "A Computer Simulation of the Performance and Dynamics HCMS Bras D'Or (FHE-400)", by R.T. Schmitke, Canadian Aeronautics and Space Journal, V. 17 N3, March 1971, pp. 95-105. Remarks: Same or similar to ASDB 10-U4848.

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DREA SEPT 72	"HMCS Bras D'Or (FHE-400) Scientific Trials", by T.G. Drummond, R.T. Schmitke, Defence Research Establishment, Atlantic, ASDB 10-C01147L, Sept. 1972.
DREA APR 73	"FH Type 4-Sketch Design of a Multipurpose Hydrofoil Patrol Vessel", by M.C. Eames, T.G. Drummond, B.V. Davis, Defence Research Establishment, Atlantic, RPT-73/10, (AD530348), ASDB 10-C00628LM, April 1973. Remarks: 250-ton redesign of the FHE-400.
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DREA JUNE 74	"Computer Program to Predict Ship Lateral Motions in Beam Seas", by R.T. Schmitke, Defence Research Establishment, Atlantic, ASDB 10-C00723L, June 1974.
DREA JULY 75(a)	"Freeboard Criterion for Hydrofoil Ships:, by R.T. Schmitke, Defence Research Establishment, Atlantic, ASDB 10-U06613LM, June 1975.
DREA JULY 75(b)	"1973-74 Proteus Hydrofoil and Propulsion Trials", by W.E. Ellis, Defence Research Establishment, Atlantic, ASDB 10-U06609LM, RPT-H/75/1, July 1975.
DREA SEPT 76	"Prediction of Wave-Induced Motions for Hullborne Hydrofoils", by R.T. Schmitke, Defence Research Establishment Atlantic, AIAA/SNAME conf. Sept. 20-22, 1976.

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DTNSRDC NOV 58	"Theoretical Prediction of the Longitudinal Motions of Hydrofoil Craft", by T.F. Ogilvie, DTNSRDC, RPT-1138,(AD206647), ASDB 10-U00409, Nov. 1958.
DTNSRDC MAR 61	"Model Investigation of the Stability and Control Characteristics of PCH", by J.H. Wolff, DTNSRDC RPT-C-1258, ASDB 10-C00060M, March 1961.
DTNSRDC MAY 68	"PCH-1 Foilborne Dynamic Response Tests", by W.C. O'Neill, DTNSRDC, ASDB 10-U07203, May 1968.
DTNSRDC JAN 69	"Lateral Stability and Turning Characteristics", DTNSRDC, ASDB 10-U07212F, Jan 1969.
DTNSRDC FEB 69	"Hydrofoil Spiral Tests", by P.C. Clawson, DTNSRDC, ASDB 10-U 01669, Feb. 1969.
DTNSRDC MAY 69 (a)	"Foilborne Lateral Stability Trials of PCH-1", by B.H. Burnside, DTNSRDC, ASDB 10-U01207F, May 1969.
DTNSRDC MAY 69 (b)	"Model Tests of the 0.075 Scale PCH-1 Mini-Mod Aft Foil System", by P.K. Spangler, DTNSRDC, ASDB 10-U01684F, May 1969.
DTNSRDC NOV 69	"Development of a Longitudinal Plane Hydrofoil Craft Simulation", by A.H. Magnuson, DTNSRDC, TN-152, ASDB 10-U01642M, Nov. 1969.
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DTNSRDC JULY 71	"Experimental Investigation of the HB-11 Hydrofoil Craft", by K.H. Harbaugh, DTNSRDC, ASDB 10-C00531M, July 1971.

DTNSRDC NOV 73 — "Prediction of Seakeeping and Maneuvering Characteristics of High Performance Craft- A State of the Art Survey", by A. Gersten, DTNSRDC, ASDB 10-U05783LM, Nov. 1973. Remarks: A survey of existing literature was carried out to determine the "state-of-the-art" with regard to prediction of seakeeping and maneuvering characteristics for novel, high-speed craft. The information was obtained to help guide the design of the coastal (medium) developmental craft (CVDC) or coastal patrol craft (CPC-X).

DTNSRDC FEB 74 (a) — "Hydrofoil Development - Issues and Answers", by W.M. Ellsworth, Jr., AIAA Paper No. 74-306, Feb. 1974.

DTNSRDC FEB 74 (b) — "The Development of Automatic Control Systems for Hydrofoil Craft", by R.J. Johnston, W.C. O'Neill, DTNSRDC, Hovering Craft and Hydrofoil, V.13, N5-6, February 1974.

DTNSRDC FEB 74 (c) — "Hydrofoil Performance in Rough Water", by D.A. Jewell, DTNSRDC, AIAA/SNAME Conf. Feb. 1974, Paper No. 74-307.

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DTNSRDC APR 74 (b) — "Hydroelastic Design of Subcavitating and Cavitating Hydrofoil Strut Systems", by P.K. Besch and Y.N. Liu, DTNSRDC Rpt. #4275, April 1974. Available NTIS (AD780776).

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DTNSRDC NOV 75	"Determination of Size and Location of Foils for 2000 Ton Hydrofoil Small Waterplane Area Ship (HYSWAS) for Vertical Plane Stability", by C.M. Lee, DTNSRDC, ASDB 10-U07554M, Nov. 1975. Remarks: Examines location, size, and deflection of foils.
DTNSRDC DEC 75	"Hydrodynamic Forces and Stability Boundaries of a Hyperventilated Hydrofoil in Calm Water and in Regular Waves", by R. G. Stahl, DTNSRDC Rpt. SPD 649-01, Avail. NTIS (AD-A027376), Dec. 1975.
DTNSRDC JAN 76	"A Study of the Hydroelastic Instabilities of Swept Supercavitating Hydrofoils", Research and Development Report, by Y-N. Liu, J.R. Caspar, DTNSRDC #4686, Avail. NTIS (AD-A020840), Jan. 1976.
DTNSRDC APR 76	"Control Response Trials of the Stable Semi-Submerged Platform", by J.A. Fein, R.T. Waters, DTNSRDC, ASDB 10-U08085M, April 1976. Remarks: For analytic control response predictions. See D.B. #10-U05962.
DTNSRDC JUNE 76	"Advanced Naval Vehicle Concept Evaluation Part 1 Technical Assessment: Hydrofoil Vol. I & Vol II", ASDB 10-C1088L, DTNSRDC, June 1976. Remarks: (Preliminary Draft) document retained by Code 1158.
DTNSRDC JULY 76	"Methods for Controlling the Sideforce on Surface-Piercing Hydrofoil Struts", by R.S. Rothblum, M.F. Jeffers, R.P. Smith, DTNSRDC, (ADA029456), ASDB 10-U08482M, July 1976.
DTNSRDC SEPT 76	"Hydrofoil Small Waterplane Area Ship (HYSWAS)", by J.R. Meyer, J.H. King, Paper No. 76-875, ASDB 10-U08653F, Sept. 1976.
DTNSRDC MAY 77	"A Summary Report of Major Studies Under the Programme 'High Speed Hydrofoil Struts and Foils'", by R. Wermter, Y.T. Shen, DTNSRDC, Hovering Craft and Hydrofoil, Vol. 16, Apr.-May 1977, p.44-51.
DTNSRDC APR 78	"Balancing Mission Requirements and Hydrofoil Design Characteristics" by D.J. Clark, W.C. O'Neill, D.C. Wight, DTNSRDC, AIAA/SNAME Paper No. 78-725, April 17-19, 1978.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
EDO, APR, 62 *	-	-	C	-	-	-	-	-	-
" JAN, 64 *	-	-	C	-	-	-	-	-	-

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EDO APR 62	"Equilibrium Configuration of a Towed Hydrofoil-Strut System in Two-Dimensional Steady Turns", by P.A. Pepper, J. Stretch, EDO Corp., RPT-5741, (AD282924), ASDB 10-U00410, April 1962.
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REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
FMC, MAY, 66 *	-	C	-	-	-	-	-	-	-
FLORIDA U, SEPT, 75	-	-	-	-	-	C	-	-	-

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FLORIDA U SEPT 75	"Effect of Sweep and Drag on Hydrofoil Stability", by J. Mahig, Florida University, ASME, Design Engineering Technical Conf., Washington, D.C., Sept 17-19, 1975.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
GD,	JUNE,	66	-	-	C	-	-	-	-	-	-
GDANSK U,	MAY,	74	-	C	-	-	-	-	-	-	-
GIANOTTI,		78	-	-	-	-	C	-	-	-	-
GIBBS,	NOV,	58	-	-	C	-	C	-	-	-	-
GRAHAM,		76	-	-	-	-	C	-	-	-	-
GRUEN,	JULY,	58	-	-	-	-	-	C	-	-	-
GRUMMAN,		*	-	B	-	-	-	B	-	-	-
"	MAR,	61	-	-	-	-	C	-	-	-	-
"		62 *	-	C	-	-	-	-	-	-	-
"		62 *	-	C	-	-	-	-	-	-	-
GRUMMAN,	JUNE,	62 *	C	-	-	-	-	-	-	-	-
"	JULY,	62	-	-	-	-	-	C	-	-	-
"	SEPT,	62 *	C	C	-	-	C	C	-	-	-
"	OCT,	62 *	-	-	-	-	-	C	-	-	-
"	JAN,	63	-	-	C	-	-	-	-	-	-
GRUMMAN,	SEPT,	65	-	-	-	-	C	-	-	-	-
"	SEPT,	66 *	-	B	-	-	-	-	-	-	-
"	MAY,	72	-	-	-	-	-	C	-	-	-
"	DEC,	72(a)	-	-	-	-	-	C	-	-	-
"	DEC,	72(b)	-	-	-	-	-	C	-	-	-

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GRUMMAN,	SEPT,	76	-	-	-	-	-	B	-	-	-
"	MAR,	77(a)	-	-	-	-	B	B	-	-	-
"	MAR,	77(b)	-	-	-	-	B	B	-	-	-
"	APR,	78					C	C	-	-	-

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GD JUNE 66	"The Subcavitating Hydrofoil (HYSTAD) Program, Phase I", Final Technical Report, General Dynamics, June 1966.
GDANSK U MAY 74	"Longitudinal Behaviour of a Hydrofoil Craft in Rough Seas", by M. Krezelewski, Paper, Ship Research Institute, Technical University of Gdansk, Poland, ASDB 10-U05673M. Remarks: Intl. Hovering Craft, Hydrofoil and Advanced Transit Sys. Conf., May 1974, England.
GIANOTTI 78	"Hydrofoil Performance Characteristics", by J.R. Buck, Gianotti and Buck Associates, Inc., Riverdale MD, AIAA Student Journal, Vol. 16, Summer 1978, p. 40-43.
GIBBS NOV 58	"Five Ton, Autopilot Stabilized, Hydrofoil Research Craft Hydrodynamic Tests and Analysis", by S.F. Hoerner, Gibbs and Cox Inc., ASDB 10-U00114F, (AD303610), Nov. 1978.
GRAHAM 76	"A Comparative Analysis of Naval Hydrofoil and Displacement Ship Design", by Graham, C., Fahy, T.E. and Grostick, J.L., Trans. SNAME, 1976, pp. 278-306.
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GRUMMAN	"Operational Testing and Evaluation of the Hydrofoil Seacraft Denison (from June 1962 through October 1963)", Grumman Aerospace Corp., ASDB 10-U00077M.
GRUMMAN MAR 61	"AGEH Hydrofoil Research Ship-Vol II-Hydrodynamics", Grumman Aerospace Corp, ASDB 10-U00006M, March 1961.
GRUMMAN 62	"H.S. Denison Pitching, Oscillations Voyage #11", Grumman Aerospace, ASDB 10-U04777F, 1962.
GRUMMAN 62	"H.S. Denison Lateral Oscillation Voyage #10 Manual Mode", Grumman Aerospace Corp., ASDB 10-U04781F, 1962.

GRUMMAN JUNE 62	"Inclining Experiment H.S. Denison", by R. Keenan, W.C. Plaiklock, RPT-M14.76, ASDB 10-U02141M, Grumman Aerospace Corp., June 1962.
GRUMMAN JULY 62	"Hydrofoil Research Ship AGEH Autopilot Development Program-Five-Degree-of-Freedom Analog Computer Simulation", by H.D. Ranzanhofer, ASDB 10-U01384F, Grumman Aerospace Corp., July 1962.
GRUMMAN SEPT 62	"The Design, Construction, and Flight Test of the H.S. Denison", by J. Craig Schroeder, Grumman Aerospace Corp., In Inst. of the Aerospace Sciences. Proc. of the National Meeting on Hydrofoils and Air Cushion Vehicles, Wash., D.C. Sept 17-18, 1962, p.114-112.
GRUMMAN OCT 62	"H.S. Denison Autopilot Data", by R. Brovetto, W. Dodson, ASDB 10-U04772F, Grumman Aerospace Corp., MA-2619, Oct. 1962.
GRUMMAN JAN 63	"AG(EH) Hydrofoil Research Ship Hydrodynamic Report of Model Test Program", by J.H. Richter, I. Palmer, ASDB 10-C00012M, Grumman Aerospace Corp, Jan. 1963.
GRUMMAN SEPT 65	"Proposal for Design and Construction of Hydrofoil Gunboat (PG(H)-Vol II Hydrodynamics", Grumman Aerospace Corp., ASDB 10-C00238M, Sept. 1965.
GRUMMAN SEPT 66	"H.S. Denison Operational Stability Report", by C.G. Pieroth, Grumman Aerospace Corp., MPD-888, ASDB 10-U01249, May 1972.
GRUMMAN MAY 72	"Analysis of Dynamic Vehicle Scale-Up Problem", Grumman Aerospace Corp., ASDB 10-U07365LM, RPT-RN-161, May 1972. Remarks: Proposal to correlate stability derivitives.
GRUMMAN DEC 72 (a)	"Optimization of Forward Foil Lift Control for AG(EH) Hydrofoil Craft. Volume I: Hydrodynamics", by H.R.J. Wright, Grumman Aerospace Corp, S-46-06, (AD-760684), Intrm Rpt; HCG-72-19(1), December 1972.
GRUMMAN DEC 72 (b)	"Optimization of Forward Foil Lift Control for AG(EH) Hydrofoil Craft. Volume II: Control", by R.M. Rose, Grumman Aerospace Corp., S-46-06, Intrm Rpt, HCG-72-19(2), (AD-760698), Dec. 1972.
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GRUMMAN MAR 77 (b)	"Advance Naval Vehicles Concepts Evaluation Point Design Final Report; (Task #4) Hyd-2 2400 Metric Ton Aircapable Hydrofoil Ship", Grumman Aerospace Corp., RPT 298-200-1, ASDB 10-C007491LM, March 1977. Remarks: Ref. ANVCE Technology Summary DB #10-C01088L.
GRUMMAN APR 78	"Grumman Design M163-A 2400 Metric Ton Air Capable Hydrofoil Ship", by C.G. Pieroth, Grumman Aerospace Corp., AIAA/SNAME Advanced Marine Vehicles Conf., San Diego, Calif., April 17-19, 1978.

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HENDY,	JUNE,	50	-	-	-	-	C	-	-	-	-
HIRSCH,	MAY,	67	-	-	-	-	-	C	-	-	-
HOERNER,	JAN,	75	-	-	C	-	C	-	-	-	-
HUGHES,	DEC,	60	-	-	-	-	-	C	-	-	-
" ,	JUNE,	61	-	-	-	-	-	C	-	-	-
HYDROFOIL CORP.			-	-	-	-	-	C	-	-	-
HYDRO,	JAN,	63(a)*	-	B	-	-	-	B	-	-	-
"	JAN,	63(b)	-	B	-	-	-	B	-	-	-
"	NOV,	67(a)	-	-	-	-	-	C	-	-	-
"	NOV,	67(b)	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

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HENDY JUNE 50	"Hydrofoil Studies and Preliminary Design Data", Hendy (Joshua) Corp., Final Report, (AD499885), ASDB 10-U01767F, June 1950.
HIRSCH MAY 67	"On the Prediction of the Seakeeping Characteristics of Hydrofoil Ships", by Hirsch, SNAME/AIAA, May 1967. See BOEING Jan. 68.
HOERNER JAN 75	"Fluid-Dynamic Lift (Practical Information on Aerodynamic and Hydrodynamic Lift)", by S. Hoerner, H. Borst, ASDB 10-U08526LF, Jan. 1975. Remarks: Hard cover. Extensive, excellent, illustrated useful treatment of lift. Library of Congress Cat. No. 75-17441. See ASDB 10-U08525 for Hoerners text on drag.
HUGHES DEC 60	"Study of Hydrofoil Stability and Control", by G. Chuck, R.K.C. Lake, Hughes Aircraft Co., (AD250431), ASDB 10-U00281M, Dec. 1960. Remarks: Parametric study of longitudinal stability.
HUGHES JUNE 61	"Longitudinal Stability and Control of Canard Hydrofoil Craft", by G. Chuck, R.C. Lake, Hughes Aircraft Co., ASDB 10-U00280, (AD265465), June 1961.
HYDROFOIL CORP.	"Longitudinal Stability Equations for Hydrofoil Craft with Constant Lift Control System:, by C.H. Kahr, Hydrofoil Corp, ASDB 10-U00278, (AD004844).
HYDRO JAN 63 (a)	"The Stability Derivatives of a Hydrofoil Boat - Part I", by M. Martin, Hydronautics, Inc., TR 001-10(1), ASDB 10-U359, Jan. 1963.
HYDRO JAN 63 (b)	"The Stability Derivatives of a Hydrofoil Boat - Part II", by M. Martin, Hydronautics, TR 001-10(II), ASDB 10 U360, Jan. 1963.
HYDRO NOV 67 (a)	"Hydrofoil Craft Dynamics in a Realistic Sea Including Automatic Control", by M. Martin, Hydronautics, Inc., TR 463-10, ASDB 10 U361, Nov. 1967.
HYDRO NOV 67 (b)	"Lateral Stability and Control of Hydrofoil Boats", by C.C. Hsu, Hydronautics, Inc., TR-463-9, (AD668992), ASDB 10-U00276M, Nov. 1967.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
LMSC, JULY, 62 *	-	-	-	-	-	C	-	-	-
" NOV, 70(a)	-	-	-	B	-	-	-	-	-
" NOV, 70(b)	-	-	C	-	-	-	-	-	-

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LMSC JULY 62 — "Transient Longitudinal Stability of a Small Surface Piercing Hydrofoil Boat", by F. Conner, A.W. Turner, Lockheed California Co., ASDB 10-U00275M, July 1962.

LMSC NOV 70(a) — "An Experimental Study of the Effects of Waves on the Ventilation of Surface-Piercing Struts", by R.L. Kramer, Lockheed Missiles and Space Co., Final Rpt, LMSCED029678, (AD-721375), Nov. 1970.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
MARAD, JAN, 64 *	-	B	-	-	-	-	-	-	-
MARWOOD,	-	-	-	-	C	-	-	-	-
MIAMI, JULY, 58	-	C	-	-	-	-	-	-	-
MINN. U,	-	-	-	C	-	C	-	-	-
" DEC, 61	-	-	-	C	-	C	-	-	-
MINN. U, NOV, 65	-	-	-	-	C	-	-	-	-
MIT, MAY, 54	-	-	C	-	-	B	-	-	-
" AUG, 54	-	-	C	-	-	B	-	-	-
" AUG, 62	-	-	-	C	-	C	-	-	-
" MAY, 73 *	-	-	-	-	C	-	-	-	-
MIT, AUG, 74	-	-	-	-	C	-	-	-	-
" DEC, 74	-	-	-	-	C	-	-	-	-
MITSUBISHI, OCT, 60	-	-	-	-	-	C	-	-	-

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MARAD JAN 64 — "Test and Trials of the H.S. Denison. II.", by E.K. Sullivan and James A. Higgins, U.S. Dept. of Commerce, Maritime Admin., Hovering Craft and Hydrofoil, vol. 3, Jan. 1964, p. 19-22.

MARWOOD 1960 — "Design Data for High Speed Displacement Type of Hulls and a Comparison with Hydrofoil Craft", by W.J. Marwood and A. Silverleaf, ONR Third Symposium on Naval Hydrodynamics, ACR-65, Supt. of Documents, U.S. Government Printing Office, Washington, D.C., 1960.

MIAMI SC JULY 58 — "Summary of Design, Construction & Flight Testing; Hydrofoil Landing Craft 'Halobates'", Miami Shipbuilding Corp., R-123, ASDB 10-U02354F, July 1958.

MINN U — "Experimental and Analytical Studies of the Longitudinal Motions of a Tandem Dihedral Hydrofoil Craft in Regular Waves", by J.M. Wetzel, University of Minnesota, St. Anthony Falls, ASDB 10-U00271, (AD243659).

MINN U DEC 61 — "Longitudinal Motions and Stability of Two Hydrofoil Systems Free to Heave and Pitch in Regular Waves", by J. M. Wetzel, W.H.C. Maxwell, University of Minnesota, ASDB 10-U00270, (AD276156), Dec. 1961.

MINN U NOV 65 — "Existence of Zero FORM-Drag and Hydrodynamically Stable Supercavitating Hydrofoils", by R. Oba, University of Minnesota, St. Anthony Falls, ASDB 10-U00482M, (AD630354), Nov. 1965.

MIT MAY 54 — "Design and Test of a Longitudinal Control System for a Hydrofoil Craft", by B.T. Hastings, F.W. Penny, J.B. Baker, Massachusetts Inst. of Tech., ASDB 10-U00268, (AD042960L), May 1954.

MIT AUG 54 — "Design and Test of a Turn Control System for Hydrofoil Craft", by G.M. Slagle, Massachusetts Inst. of Tech., ASDB 10-C00358M, Aug. 1954.

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MIT MAY 73 — "Wave Effects of a Free Surface Piercing Hydrofoil", by E.C. Kern, Jr., Massachusetts Inst. of Tech., PhD Thesis, May 1973.

MIT AUG 74	"Hydrofoil Strut Array Hydrodynamics", by R.L. Schaffer, Massachusetts Inst. of Tech., MS Degree, Aug. 1974.
MIT DEC 74	"Water, Air and Interface Vehicles", by P. Mandel, Massachusetts Inst. of Tech., ASDB 10-U06467M, Dec. 1974. Remarks: Draft versions of Chapters 1 & 2.
MITSUBISHI OCT 60	"Theoretical Consideration of the Longitudinal Stability and Wave Response of Hydrofoil Supported Craft", by T. Fujino, Mitsubishi Shipbuilding and Engineering Co, Ltd., ASDB 10-U02063F, Oct. 1960. Remarks: Presented to Northern and Southern Calif. Sections of SNAME 10-8-60.

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NACA,		48	-	-	-	-	-	C	-	-	-
NASA,	NOV,	43	-	-	-	C	-	-	-	-	-
"	SEPT,	52	-	-	-	C	-	-	-	-	-
"	APR,	76	-	-	-	-	-	C	-	-	-
NAVSEC,	JULY,	64	-	-	-	-	-	C	-	-	-
NAVSEC,	SEPT,	64	-	-	-	-	-	C	-	-	-
"	JAN,	65	-	-	C	-	-	-	-	-	-
"	JUNE,	71	-	C	-	-	-	-	-	-	-
"	JAN,	73	-	-	-	-	-	C	-	-	-
NISHIYAMA,	NOV,	62	-	-	-	-	-	C	-	-	-
NOBLE,	OCT,	60	-	-	-	-	-	C	-	-	-
NTDC,	DEC,	66(a)	-	-	-	-	-	C	-	-	-
"	DEC,	66(b)	-	-	-	-	-	C	-	-	-
NTS,	OCT,	66	-	C	-	-	-	-	-	-	-

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NACA 48 — "Theoretical Motions of Hydrofoil Systems", by Frederick H. Imlay, NACA Report No. 918, 1948.

NASA NOV 43 — "Preliminary Tests to Determine the Dynamic Stability Characteristics of Various Hydrofoil Systems for Seaplanes and Surface Boats", by J. M. Benson, B.A. King, National Aeronautics and Space Administration RB-3K02, ASDB 10-U00273, Nov. 1943.

NASA SEPT 52 — "Preliminary Investigation of the Static and Dynamic Longitudinal Stability of a Grunberg Hydrofoil System", by N.S. Land, D.B. Chambliss, NASA RM-L52015, ASDB 10-U00272, Sept. 1952.

NASA APR 76 — "Investigation of Longitudinal Control System for a Small Hydrofoil Boat", by W.H. Phillips, J.D. Shaughnessy, NASA, Langley Research Center, Journal of Hydronautics, vol. 10, April 1976, p. 39-45.

NAVSEC JULY 64 — "Motions of a Surface Piercing Hydrofoil Craft in Regular Waves", Bureau of Ships, (NAVSEC),translation 869, July 1964,ASDB 10-U0274.

NAVSEC SEPT 64 — "Survey of Ship Motion Stabilization", by A. J. Giddings, R. Wermter, Bureau of Ships,(NAVSEC), Sept. 1964, ASDB 10-U01969. Remarks: "Advance Copy".

NAVSEC JAN 65 — "Prediction of Lift and Cavitation Characteristics of Hydrofoil-Strut Arrays", by R.S. Johnson, Marine Technology (SNAME) Jan.1965, 57.

NAVSEC JUNE 71 — "Machinery Maintenance Engineering Assistance to PGH-2 TUCUMCARI (Trip Report to Copenhagen, Denmark)", by R.A. Weiss, NAVSEC ASDB 10-C00529M, June 1971. Remarks: Inspection of PGH-2-Pump-Turbine allignment; pump perf.; speed charact.; airborne noise; and craft stability.

NAVSEC JAN 73 — "FLAGSTAFF (PGH-1) Radar Height Sensor Installation", NAVSEC, ASDB 10-C00732, Jan. 1973.

NISHIYAMA NOV 62 — "Method for Estimating the Lateral Statistical Stability of Hydrofoil Craft", by T. Nishiyama, Magazine Article, Naval Engineers Journal, ASDB 10-U00386, Nov. 1962.

NOBLE OCT 60	"Stability and Stabilization of Craft Supported by Fully-Submerged Hydrofoils", by T.F. Noble, H.E. Harris, V.F. Williams, SNAME, ASDB 10-U0259F, Oct. 1960. Remarks: Presented at the Southern Calif. Section, 10-8-60.
NTDC DEC 66 (a)	"Hydrofoil Simulation Equations Study-Performance Criteria and Test Report for Hydrofoil Craft", by J.J. Jamieson, W.E. Farris, Naval Training Device Center, ASDB 10-U01691M, (AD649458), Dec. 1966.
NTDC DEC 66 (b)	"Hydrofoil Simulation Equations Study-Final Report, Hydrofoil Simulation Equation of Motion", by J.J. Jamieson, Naval Training Device Center, ASDB 10-U01695M, (AD649365), DEc. 1966.
NTS OCT 66	"Maneuvering Trials of HIGH POINT", by K.G. Willey, Naval Torpedo Station, Keyport, Washington, RPT-718, ASDB 10-C00050F, Oct. 1966.

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
OCEANICS,	FEB, 64	-	-	-	-	-	C	-	-	-
"	OCT, 72	-	-	-	-	-	C	-	-	-
OTEF,	MAR, 70	-	B	-	-	-	-	-	-	-

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OCEANICS FEB 64	"A Study of Hydroelastic Stability of Partially Cavitated Hydrofoils by Applicaton of Quasi-Steady Theory", by P. Kaplan, L.J. Zeckendorf, Oceanics, Inc., (AD-601010), Feb. 1964.
OCEANICS OCT 72	"Determination of Stability Derivatives of Hydrofoil Craft Via System Identification", by P. Kaplan, T.P. Sargent, Oceanics, Inc., Final Rpt, 72-93, (AD-755738), Oct. 1972.
OTEF MAR 70	"Conduct an Operational Evaluation of Hydrofoil Gunboats PGH-1 and 2-First Partial Report", Operational Test and Evaluation Force, RPT-0/S-140, ASDB 10-C00134M, March 1970. Remarks: Reports on the operational evaluation conducted on the patrol gunboats hydrofoil FLAGSTAFF (PGH-1) and to TUCUMCARI (PGH-2) to determine the operational suitability of each craft.

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PAYNE, MAR, 62	-	-	-	-	-	C	-	-	-
PRINGIERS, MAY, 64	-	-	-	-	-	C	-	-	-

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PAYNE
MAR 62
"Hydrodynamic Instability", by H.E. Payne, Undersea Technology, Vol. 3, No. 2, March 1962, ASDB 10-U02071F.

PRINCIERS
MAY 64
"A Theoretical Approach to the Problem of Harmonic Motions and Forces on a Hydrofin Boat in Regular Waves", by Christian Pringiers, Hovering Craft and Hydrofoil, vol. 3, May 1964, p. 16-24.

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
RANZENHOFER,	MAY, 67	-	-	-	-	-	C	-	-	-
RCA,	JULY, 63	-	-	-	-	-	C	-	-	-
"	AUG, 63	-	-	-	-	-	C	-	-	-
ROCKWELL,	JUNE, 62	-	-	-	-	-	C	-	-	-
RTI,	JAN, 70(a)	-	C	-	-	-	-	-	-	-
"	JAN, 70(b)	-	B	-	-	-	B	-	-	-

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RANZENHOFER
MAY 67
"Development of an Autopilot for the DOLPHIN Hydrofoil", by H. Ranzenhofer, AIAA/SNAME Advanced Marine Vehicles Conference, Paper number unknown, May 1967.

RCA
JULY 63
"Mechanical Hydrofoil Control System Preliminary Design Program", Radio Corp. of America, CR-588-93, (AD419085), ASDB 10-U00349, July 1963.

RCA
AUG 63
"Engineering Summary Report on a Hydrofoil Autopilot System Design Study Program", by D. Wellinger, R.C. Blanchard, Radio Corp. of America, CR-588-78-R, (AD431916), ASDB 10-U00294, Aug. 1963.

ROCKWELL
JUNE 62
"Hydrofoil Control Study for Bureau of Ships-Final Report", by R. Olshausen, E.C. Bridges, J.G. Krol, Rockwell International Corp., ASDB 10-U00402, (AD427002), June 1962.

RTI
JAN 70 (a)
"Hydrofoil Craft Manual of Technical Trial Requirements - Vol.I", prepared by Robert Taggart Inc. for DTNSRDC, January 1970. ASDB 10-U00149.

RTI
JAN 70 (b)
"Hydrofoil Craft Manual of Technical Trial Requirements - Vol.II", prepared by Robert Taggart Inc. for DTNSRDC, January 1970. ASDB 10-U00150.

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SHPERLING,	MAR,	75		-	-	-	-	-	C	-	-	-
SIT,	JULY,	51		-	-	-	-	-	B	-	-	-
"	JULY,	53		-	-	-	-	-	B	-	-	-
"	OCT,	59	*	-	-	-	-	-	B	-	-	-
"	DEC,	59		-	-	-	C	-	C	-	-	-
SIT,	SEPT,	60	*	-	-	-	-	-	B	-	-	-
"	MAR,	61		-	-	C	-	-	-	-	-	-
"	NOV,	62(a)	*	-	-	C	-	-	-	-	-	-
"	NOV,	62(b)		-	-	-	-	-	C	-	-	-
"	JAN,	64		-	-	-	-	-	C	-	-	-
SIT,	MAR,	64		-	-	-	-	-	C	-	-	-
"	MAY,	67(a)		-	-	-	C	-	-	-	-	-
"	MAY,	67(b)		-	-	-	-	-	C	-	-	-
"	MAY,	69		-	-	-	B	-	-	-	-	-
"	APR,	73(a)		-	-	-	B	-	-	-	-	-
SIT,	APR,	73(b)		-	-	-	C	-	-	-	-	-
SNAME,		74		-	-	-	-	C	-	-	-	-
SPC,				-	-	-	-	-	C	-	-	-
"	NOV,	67		-	-	-	-	-	C	-	-	-
SRI,	JAN,	62		-	-	-	-	C	-	-	-	-

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SRI,	SEPT,	67		-	-	-	-	-	B	-	-	-
SUPRAMAR,	JAN,	63		-	-	C	-	-	-	-	-	-
"	AUG,	63		-	-	C	-	-	-	-	-	-
"		64	*	C	C	-	-	-	-	-	-	-
"	JAN,	69		-	-	-	-	C	C	-	-	-
SUPRAMAR,	JAN,	72	*	-	-	-	-	-	B	-	-	-
"	DEC,	76	*	-	-	-	-	-	A	-	A	-

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SHPERLING MAR 75	"Comprehensive Automatic Control System for Soviet Hydrofoil Craft TAIFUN", by M.G. Shperling, Hovering Craft and Hydrofoil, Vol. 14, N6, March 1975, pp. 23-27.
SIT JULY 51	"Longitudinal Stability Study for Hydrocraft for ONR", by W.C. Hugli, Jr., Stevens Inst. of Tech., R-148, ASDB 10-C00139F, July 1951.
SIT JULY 53	"Theoretical Analysis of the Longitudinal Stability of a Tandem Hydrofoil System in Smooth Water", by W.C. Hugli, P. Kaplan, Stevens Inst. of Tech., R-479, ASDB 10-U00297,(AD018510L), July 1953.
SIT OCT 59	"Longitudinal Stability of Surface-Piercing Hydrofoil Systems For Water-Based Aircraft", by G. Fridsma, Stevens Inst. of Tech., R-732, ASDB 10-U00300, (AD227478), Oct. 1959.
SIT DEC 59	"Longitudinal Stability and Motions of a Tandem Hydrofoil System in a Regular Seaway", by P. Kaplan, Stevens Inst. of Tech., R-517, ASDB 10-U00298, (AD230012), Dec. 1959.
SIT SEPT 60	"Hydrofoils Running Near the Water Surface", by S. Schuster, H. Schwanecke, Stevens Inst. of Tech., R-169-60, ASDB 10-U02657, Sept. 1960.
SIT MAR 61	"Hydrodynamic Tests of a 1/10-Scale Model of Grumman LVH Design", by G. Fridsma, Stevens Inst. of Tech., LR-826, ASDB 10-U00301, March 1961.
SIT NOV 62 (a)	"Experimental Determination of Surface-Piercing Fully Ventilated Hydrofoil Stability Derivatives by a Free Oscillation Technique", by G. Fridsma and P.W. Brown, Stevens Inst. of Tech., R-897, ASDB 10-U00689, (AD292967), Nov. 1962.
SIT NOV 62 (b)	"Hydrofoil Motions in Irregular Seas", by R.P. Bernicker, Stevens Inst. of Tech., R-909, ASDB 10-U00302, (AD292965), Nov. 1962.
SIT JAN 64	"Deterministic Predictions of the Motions of a Hydrofoil Craft in Irregular Seas", by R.P. Bernicker, Stevens Inst. of Tech., R-1003, ASDB 10-U00391, (AD292965), Jan. 1964.

SIT MAR 64 — "Parametric Study of Dynamic Stability and Rough Water Motions on Uncontrolled and Simply Controlled Submerged Hydrofoil Systems", Stevens Inst. of Tech., P-255, ASDB 10-U01149, March 1964.

SIT MAY 67 (a) — "Heave and Pitch Response Curves of AG(EH) in Regular Waves", by Y.A. Chey, Stevens Inst. of Tech., ASDB 10-C01184M, May 1967.

SIT MAY 67 (b) — "Application of Lifting-Surface Theory to the Prediction of Hydroelastic Response of Hydrofoil Boats", Final Report, by Charles J. Henry, Stevens Inst. of Tech., May 1967.

SIT MAY 69 — "Dynamic Model Tests of the AGEH Hydrofoil Craft-Hydrofoil Characteristics, Response Operators, Take-off in Waves, and Crash Landings", by P.W. Brown, Y.H. Chey, Stevens Inst. of Tech., R-1276, ASDB 10-U08046M, (AD5049911),May 1969. Remarks: See also confidential movies of tests.

SIT APR 73 (a) — "Control Failure Simulations of the PHM Hydrofoil Craft Using a 1/20-Scale Dynamic Model with Automatic Control", by C.J. Henry, Stevens Inst. of Tech., ASDB 10-U02770M, (AD766098), April 1973.

SIT APR 73 (b) — "Seakeeping Characteristics of Four Members of Hydrofoil Hull Series 65", by R.L. Van Dyck, Stevens Inst. of Tehc., Final Rpt SIT-DL-72-1563, April 1973, (AD-777733/7).

SNAME 74 — "Glossary for High-Speed Surface Craft", SNAME T & R No. R-17, 1974.

SPC — "Autopilot System Study for Hydrofoil Craft, Final Report", by H.E. Harris, R.E. Smith, Sperry Piedmont Co., SP-JA-250-0037, ASDB 10-U00295, (AD431677).

SPC NOV 67 — "Correlation of Computer Simulation and Full-Scale Data", by H.E. Harris, R.E. Smith, Sperry Engineering Review, ASDB 10-U00040M, Vol. 20, No.2, Nov. 1967. Remarks: Briefly discusses three examples.

SRI
JAN 62 "Operating Manual for Load-Measuring Hydrofoil Models", by G.E. Ransleben, Southwest Research Institute, 38-1028-2, ASDB 10-U02653, Jan. 1962.

SRI
SEPT 67 "Hydroelasticity with Special Reference to Hydrofoil Craft", by H. Norman Abramson, Wen-Hwa Chu, and Jack T. Irick, Southwest Research Institute, DTNSRDC Report 2557, September 1967.

SUPRAMAR
JAN 63 "Tests with the Experimental Boat ST-3A with Air-Controlled Fully Submerged Foils", by H. Von Schertel, O. Munch, H. DeWitt, Supramar, Ltd., Switzerland, RPT-N4, ASDB 10-U00413LM, (AD830764L), Jan. 1963.

SUPRAMAR
AUG 63 "Tests with the Experimental Boat ST-3A with Air-Controlled Fully Submerged Foils", Supramar, Ltd., ASDB 10-U00685M, (AD 830764L), Aug. 1963, Monthly Rept.No.42, Forwarding Rpt. N4.

SUPRAMAR
64 "Comparative Tests II Between an Air-Stabilized and a Conventional Supramar PT 50", by Von Shertel, Supramar,Ltd., ASDB 10-U0095M, 1967.

SUPRAMAR
JAN 69 "Air-Feed Stabilization of Hydrofoil Craft", by H. Von Schertel, Paper, Supramar, Ltd., ASDB 10-U00390M, Jan. 1969.

SUPRAMAR
JAN 72 "A New Inherently Stable Surface Piercing Foil System: A Breakthrough in Smooth Sea Performance", by Von Schertel, Supramar, Hovering Craft and Hydrofoil, V.11 N4, Jan.1972.

SUPRAMAR
DEC 76 "Study of Surface Piercing and Other Hydrofoil Systems, with Appendix (Drawings)", Supramar, Ltd, Switzerland, ASDB 10-U08808M, December 1976.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
TORONTO U,	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

TORONTO U

"Feasibility Study of a Proposed Control System on a Hydrofoil Sailboat", by P.L. Davis, Toronto Univ, Ontario, Inst. for Aerospace Studies.

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USCG, OCT, 70 *	-	B	-	-	-	-	-	-	-
USMMA, DEC, 71	-	-	-	-	C	C	-	-	-

A = 1st Class Material, Important to Program

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USCG 9 OCT 70	"Hydrofoil-Equipped 30-Foot Utility Boat", by R.W. Witter, United States Coast Guard, Field Testing and Development Center, FTDC-516, 9 Oct. 1970, (AD-765923/8).
USMMA DEC 71	"Research on Hydrofoil Craft", by S. Schuster, Hovering Craft and Hydrofoil, Vol. 11 N3, Dec. 71, pp 5-10, United States Merchant Marine Academy, N-335.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
VAN DE VOORDE, MAY, 75 *	-	-	-	-	C	C	-	-	-

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C = Useful but Nonessential to Program

B = Supporting Material

VAN DE VOORDE
MAY 75

"Review of Hydrofoil Craft Development", by C.B. van de Voorde, Institute for Mechanical Constructions, Delft, Netherlands. Avail. NTIS, No. N76-10343.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
YUDIN, 65	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

YUDIN 65 "Influence of the Hydrodynamic Instability Factor on the Pitching of Ships with Deeply Submerged Hydrofoils", by Y.R. Yudin, ASDB 10-U02431M, 1965. Remarks: Longitudinal plane only (Russian translation).

BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY SUPPORTED CRAFT

VOLUME V

A CATEGORIZED BIBLIOGRAPHY OF PLANING CRAFT STABILITY RELATED REPORTS

by

David R. Lavis
Edward G.U. Band
Alexander W. Fowler
Edgar D. Hoyt

Task 1 Report
Contract No. DOT-CG-806510-A

for

U. S. Department of Transportation
United States Coast Guard
Office of Research and Development
Washington, D. C. 20590

INTRODUCTION

This Document contains a general bibliography of Planing Craft stability related reports. It is one of a series of bibliographies which have been prepared for the United States Coast Guard's (USCG's) investigation of the stability of dynamically supported craft. The other bibliographies in this series are:

- A Bibliography of Amphibious Air Cushion Vehicle (ACV) Stability Related Reports.
- A Bibliography of Rigid Sidehull Surface Effect Ship (SES) Stability Related Reports.
- A Bibliography of Hydrofoil Craft Stability Related Reports.
- A General Bibliography of Ship and Small Craft Stability Related Reports.

Entries in the bibliography have been made in alphabetical order using the Author's company (or affiliation) or Author's last name if his company and affiliation are unknown or are less descriptive of the source.

A "Reference Evaluation and Subject Index" table is provided for each group of alphabetical entries. These tables provide an indication of the relevance or value of each document to the study of craft stability and also places each within one of nine separate subject categories. The value of each document to the subject of craft stability has been indicated by assigning a letter A, B. or C to each entry using the following classification.

A: First Class Material, Important to Program

B: Supporting Material

C: Useful but not Essential to Program

The subjects into which each document has been categorized are defined as follows:-

Full Scale Operations, Static

Report contains full scale information of a non-dynamic nature, e.g. static stability testing, (craft stationary and/or at forward speeds) and/or general steady state operational behavior, including operators overall assessments.

Full Scale Operations, Dynamic

Report contains full scale information on craft dynamic behavior, e.g. seakeeping, maneuvering, response transients, dynamic stability, or dynamic behavior in general including operators overall assessments.

Model Tests, Static

Report contains model test information of a non-dynamic nature, e.g. craft and component static stability testing (model stationary and/or at forward speeds), calm water resistance tests, including test results and/or descriptions of test techniques.

Model Tests, Dynamic

Report contains test information on model dynamic behavior, e.g. towing tank or free (maneuvering) model dynamic tests, dynamic transient tests, seakeeping including surf tests, results and/or description of test techniques.

Analytical Studies, Static

Report contains analytical studies related to craft static stability.

Analytical Studies, Dynamic

Report contains analytical studies related to craft dynamic stability, e.g. analyses of craft capsizing, seakeeping, maneuvering, motion response, acceleration response, hull slamming, survivability.

Accident Reports

Report contains a specific account of, comment on, or analysis of a craft stability related accident which has resulted in property damage, personal injury or loss of life.

Criteria

Report contains information on craft stability related criteria, e.g. specific criteria or standards, design guidelines or practices for adequate craft stability, human tolerance to craft motions, safety limits, regulatory issues and standards.

Environment

Report contains information concerning weather conditions, e.g. wind, sea state, icing etc. Report may also contain information on forcast and hindcast techniques, and probabilistic description of severity.

The bibliography has been compiled from a fairly comprehensive search of the following sources.

1. The National Technical Information Service (NTIS)
2. The Royal Institution of Naval Architects (RINA)
3. Society of Naval Architects & Marine Engineers (SNAME)
4. North Carolina Science & Technology Research Center
5. U.S. Naval Academy Library
6. David W. Taylor Naval Ship Research & Development Center (DTNSRDC)

7. American Institute of Aeronautics & Astronautics (AIAA)
8. American Society of Mechanical Engineers (ASME)
9. U.S. Department of Transportation (DOT)
10. Engineering Index Inc. New York, N.Y.
11. Maritime Research Information Service (MRIS)
12. The British Ship Research Association (BSRA)
13. National Aeronautics & Space Administration (NASA)
14. Hovering Craft & Hydrofoil, Kalergi Publications
15. Robert Trillo Ltd. Hampshire, U.K.
16. Band, Lavis & Associates, Inc., Severna Park, MD.

GLOSSARY

AEW	Admiralty Experiment Works (British)
ARC	Air Research Council (British)
BILES	J. H. Biles and Co.
BLADE HULLS	Blade Hulls, Inc.
DAVIDSON	Davidson Laboratory
DTNSRDC	David W. Taylor Naval Research and Development Center
HYDRONAUTICS	Hydronautics, Inc.
LITTON	Litton Ship Systems
MIT	Massachusetts Institute of Technology
MONARK	Monark Technology
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NAVSEC	Naval Ship Engineering Center
NIOTC	Naval Inshore Operations Training Center
NPRDC	Naval Personnel Research and Development Center
NSWC	Naval Surface Weapons Center
OPTEVFOR	Operational Test and Evaluation Force, U.S. Navy
ONR	Office of Naval Research
RAE	Royal Aircraft Establishment, England
SIT	Stevens Institute of Technology
SNAME	Society of Naval Architects and Marine Engineers
USCG	United States Coast Guard
WYLE	Wyle Laboratories

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REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
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"	DEC,	74	B	B	-	-	-	-	-	-	-
ANGELI,	APR,	70	-	-	-	-	C	-	-	-	-
"	FEB,	71	B	B	-	-	B	B	-	-	-
ANGELI,	APR,	73	-	-	-	-	B	B	-	-	-
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ARKOWITZ,	OCT,	66	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

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AEW
AUG 69
"HMS Brave Swordsman Seakeeping Trials", by H.J.S. Canham, Admiralty Experiment Works, Haslar, England, AEW RPT No. 19/69, ASDB 10-C00934L, Aug. 1969. Remarks: Provides data on seakeeping trials conducted in the fast patrol boat HMS Brave Swordsman which were recorded while the boat was operated at maximum power in different sea states at various headings.

AEW
DEC 74
"Sea Knife Evaluation Trials", by G.H. Vick, Admiralty Experiment Works, Hasler, England, Report No. 52/74, December 1974. Remarks: Performance, stability and handling tests of super-critical planing hull.

ANGELI
APR 70
"Evaluation of the Effect of Flaps on the Trim and Drag of Planing Hulls", by J.C. Angeli, ASDB 10-U07813M, April 1970. Remarks: Presents simple procedures that are intended to provide designers with means of evaluating the variation of trim and drag that can be anticipated form a flap of given dimensions.

ANGELI
FEB 71
"Evaluation of the Quality of Planing Boat Designs", by J.C. Angeli, SNAME Southeast Section Meeting, 18th Feb. 1971.

ANGELI
APR 73
"Evaluation of the Trim of a Planing Boat at the Inception of Porpoising", by J.C. Angeli, presented to SNAME Spring Meeting, Lake Buena Vista, Florida,2-4 April 1973.

ASSET INC.
JAN 77
"Small Craft Design Guide", Asset, Inc. Report No. 23086-1 Prepared for DTNSRDC, Jan. 1977.

ARKOWITZ
OCT 66
"Recent Developments in Seakeeping Research and Its Application to Design", by M.A. Arkowitz, L.A. Vassilopoulos, F.H. Sellars, Paper No. 5, Society of Naval Architects and Marine Engineers, ASDB 10-U01478, Oct. 1966. Remarks: Annual meeting, Nov. 10/11, 1966, New York, New York.

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BILES, NOV, 77	-	-	-	-	-	-	-	A	-
BLADE HULLS, AUG, 72	C	C	C	C	C	C	-	-	-
BOVET, OCT, 74	B	B	B	B	-	A	C	B	B
BOEHE, 74	B	-	-	-	-	-	-	-	-
BROWN, APR, 76	-	-	C	C	-	-	-	-	-
BROWN, D.K. MAR, 78	B	B	-	-	-	-	-	-	B
BUCK, OCT, 74	C	C	-	-	C	-	-	-	-

A = 1st Class Material, Important to Program

B = Supporting Material

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BESSHO JUNE 74	"On Motions of a High Speed Planing Boat in Regular Head Seas", by M.Bessho, M. Komatsu, and M. Anjoh, Journal of Society of Naval Architects of Japan, V135, June 1974, pp 109-120, Japanese.
BILES NOV 77	"The Evolution of Safety Requirements for Dynamically Supported Craft" by J.M. Cox, J.H. Biles and Co., London, Hovering Craft and Hydrofoil, Vol. 17, Nov. 1977, pp 27-36, discussion p. 37, author's reply, p. 37.
BLADE HULLS AUG 72	"Some Notes on the Sea Knife", by P.R. Payne, Blade Hulls, Inc. ASDB 10-U01275F, August 1972. Remarks: Contains various reprinted articles written on the sea knife and its design characteristics. The craft is described as an entirely new kind of high-speed, waterborne vehicle, developed form a blend of hydrofoil, aircraft, and planing hull technologies.
BOVET OCT 74	"Recent Coast Guard Research into Vessel Stability", by D.M. Bovet, R.E. Johnson, and E.L. Jones, Marine Technology, Vol.11, no.4, pp. 329-339, October 1974.
BOEHE 74	"Modern Fast Patrol Boats", by Rolf Boehe, International Defense Review 6/1974, p. 737-742. Comment: Contains design characteristics of a large number of large high speed planing craft.
BROWN APR 76	"Hydrodynamic Model Evaluation of a Series of Planing LVA Concepts", by P.W. Brown, SIT Rept. No. SIT-DL-76-1880, April 1976.
BROWN MAR 78	"Small Warships in the Royal Navy and the Fishery Protection Task", by D.K. Brown and P.D. Marshall, Symposium on Small Fast Warships and Security Vessels, RINA, March 1978.
BUCK OCT 74	"Hydrodynamic Design for High Performance Craft", by Buck, Fuller, and Kennel, LS-CH, NAVSEC, Oct. 1974.

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CHRISTOPHER		COPY NOT FOUND IN TIME FOR REVIEW							
CLEMENT, 56	-	-	C	B	-	-	-	-	-
" 56	C	-	-	-	-	-	-	-	-
" 61	-	-	-	-	C	-	-	-	-
" NOV, 63	-	-	-	-	-	B	-	B	-
" 64	-	-	-	-	C	-	-	-	-
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" MAY, 66	-	-	-	-	C	-	-	-	-
" 67	-	-	-	-	C	-	-	-	-
" , JUN, 71	-	-	-	-	C	-	-	-	-

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CHRISTOPHER 56 — "Effect of Shallow Water on the Hydrodynamic Characteristics of a Flat-Bottom Planing Surface", by K.W. Christopher. NACA TN3642, 1956.

CLEMENT 56 — "Analyzing the Stepless Planing Boat", by E.P. Clement, DTMB Report 1093, 1956.

CLEMENT 61 — "Stepless and Stepped Planing Hulls - Graphs for Performance Prediction and Design", by E.P. Clement and Pope, DTMB Report 1490, 1961.

CLEMENT 14 NOV 63 — "Resistance Tests of a Systematic Series of Planing Hull Forms", by E.P. Clement, SNAME, Nov. 14-15, 1963, pp. 491-561. Remarks: Tests of 5 models of different length to beam ratio includes limits of porpoising.

CLEMENT 64 — "A Lifting Surface Approach to Planing Boat Design", by E.P. Clement, DTMB Report 1902, 1964.

CLEMENT 66 — "The Planing Characteristics of a 15-Degree Deadrise Surface with Circular Camber", by E.P. Clement, DTMB Report 2298, 1966.

CLEMENT MAY 66 — "Performance Limits of the Stepless Planing Boat and the Potentialities of the Stepped Boat", by E.P. Clement, SNAME SE 5/66, paper C1, May 1966.

CLEMENT 67 — "Effect of Length-Beam Ratio on the Performance of a Stepped Planing Boat with an Adjustable Stern Stabilizer", by E.P. Clement, DTMB Report 2552, 1967.

CLEMENT JUNE 71 — "Hydrodynamic Design Procedure for a Dynaplane Boat", by E.P. Clement, Springston, and Moore, NSRDC Report No. 2871, June 1971.

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" MAR, 68	B	B	B	B	-	-	-	-	-
" OCT, 69	-	B	-	-	-	-	-	-	-
" JAN, 70	REPORT NOT OBTAINED IN TIME FOR REVIEW								
DTNSRDC, JUN, 70	REPORT NOT OBTAINED IN TIME FOR REVIEW								
" FEB, 72	-	-	-	-	-	C	-	-	-
" JUL, 72	-	-	-	-	-	B	-	B	-
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" SEPT, 75	-	-	-	-	-	B	-	-	-
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" APR, 76	-	-	-	A	-	A	-	-	-
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" APR, 77	-	C	-	-	-	C	-	-	-
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" SEPT, 78	-	-	-	B	-	B	-	-	-
DUCANE, 73	B	B	B	B	B	B	-	C	C

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DTNSRDC JUNE 67	"High Speed Results of Rough Water Trials on Two Experimental Boats", by J.J. Foster and R.J. Stenson, DTNSRDC, ASDB 10-U03618L, June 1967.
DTNSRDC MAR 68	"Correlation of Full-Scale Trials and model Tests for a Small Planing Boat", by D.L. Blount, G.R. Stuntz, D.L. Gregory, DTNSRDC, ASDB 10-U06798M, Paper 3, March 1968. Remarks: Describes and discusses the full-scale trials and model tests of a LDVP(T). These tests presented an unprecedented opportunity to compare model and full-scale measurements that had not been previously possible.
DTNSRDC OCT 69	"General Dynamics Seaworthiness Tests of LHA Landing Craft Loading Problems", by A.E. Baitis, ASDB 10-U03113L, Oct. 1969.
DTNSRDC JAN 70	"Evaluation of Systems for Improving the Habitability, Seaworthiness and Powering Characteristics of PCF'S", by A.E. Baitis and R. Stahl, ASDB 10-C00939L, Jan. 1970. Remarks: Presents test results which indicate that the performance of the prototype may be improved through trim control and also presents an evaluation of two operational systems.
DTNSRDC JUNE 70	"Resistance Characteristics of an Air Cushion Planing Hull (ACPH) Vehicle" by F.W. Wilson, R.E. Helme, ASDB 10-U03118L, DTNSRDC, June 1970. Remarks: This report presents the results of resistance measurements on a model of a planing hull fitted with the simplified seals of an ACV.
DTNSRDC FEB 72	"Prediction of Three-Dimensional Pressure Distributions on V-Shaped Prismatic Wedges During Impact or Planing", by H.P. Gray, R.G. Allen, and R.R. Jones, DTNSRDC, -3795, Feb. 1972.
DTNSRDC JULY 72	"An Engineering Approach to Hydroplane Design", by R.L. Shaffer, C.G. Cox, R.L. Garthwaite, AIAA # 72-608, July 1972, 13 pp.
DTNSRDC DEC 74	"Investigation into the Performance of NSRDC Model 5184 Configured as a Partial Hydrofoil Supported Planing Craft and a Comparison with a Prediction Technique", by G. Karafiath, DTNSRDC, ASDB 10-U06260, DEc. 1974. Remarks: Presents a powering prediction technique for partial hydrofoil supported (PHS) planing craft; results of experiments to verify the technique using a hard-chine planing hull model and a tee-shaped foil-strut-pod model.

DTNSRDC SEPT 75 — "Comparative Seakeeping Characteristics of Two U.S. Coast Guard Patrol Boats in Regular Waves", by N.K. Bales, DTNSRDC, ASDB 10-U08430F,(ADA015951),Sept. 1975. Remarks: Compares the seakeeping characteristics of two USCG Patrol boats, a 95 ft. WPB and a 140 ft. WAGB. The comparison is based on computed, nondimensional responses in regular waves.

DTNSRDC MAR 76 — "Rolling Moment Characteristics of a Planing Hull with Wedges", by Stephen B. Denny and Arthur W. Block, DTNSRDC Rept. SPD 668-01, ADA022555, March 1976.

DTNSRDC APR 76 — "Theoretical Determination of Porpoising Instability of High-Speed Planing Boats", by M. Martin, DTNSRDC, ASDB 10-U08436M, (ADA030218) Apr. 1976. Remarks: Describes a theoretical method, derived for predicting trim angle and speed coefficient at the inception of porpoising of prismatic planing hulls.

DTNSRDC AUG 76 — "Advanced Naval Vehilces Concepts Evaluation-Planing Vehicle Technical Assessment", by J.L. Gore, J.B. Hadler, D. Savitsky, DTNSRDC, ASDB 10-C01059LM, Aug. 1976. Remarks: Assessment of the design and construction of planing craft and ships, particularly combatants, indicating the current state-of-the-art and the need for further development in the various technological areas.

DTNSRDC APR 77 — "Planing Hull Feasibility Model", by J.B. Hadler et al, DTNSRDC, RPT TM 15-77-69, April 1977.

DTNSRDC APR 77 — ""Projections of Load/Response Characteristics of a Nominal 1000 Long Ton Planing Ship Based on Re-Analysis and Exploitation of Model and Full Scale CPIC-X Data", by R.G. Allen, DTNSRDC, TM 77-173-44, April 1977, Confidential.

DTNSRDC JUNE 77 — "SEA KNIFE-CPIC-X - Comparison of Model Resistance and Ship Motion Experiments", by J.B. Hadler, DTNSRDC, SPD 780-01, June 1977, "For Official Use Only".

DTNSRDC SEPT 78 — "Theoretical Prediction of Motions of High-Speed Planing Boats in Waves", by Milton Martin, DTNSRDC, 76-0069, Journal of Ship Research, Sept. 1978.

DUCANE 73 — "High Speed Small Craft" by Peter Ducane, Fourth Edition, DeGraff, Tuckahoe, N.Y., 1973.

AD-A083 568 BAND LAVIS AND ASSOCIATES INC SEVERNA PARK MD F/G 13/10
BACKGROUND STUDY OF INTACT STABILITY STANDARDS FOR DYNAMICALLY --ETC(U)
APR 79 D R LAVIS, E G BAND, A W FOWLER DOT-CG-806510-A
UNCLASSIFIED 117-2 USCG -D-75-79 NL

4 OF 4
AD A083568

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
GOLDBERG, FEB, 74	-	-	-	-	-	-	-	A	-
GRAUL 67	NOT OBTAINED IN TIME FOR REVIEW								

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

GOLDBERG 25 FEB 74	"Current Status of U.S. Navy Stability and Buoyancy Criteria for Advanced Marine Vehicles", by L.L. Goldberg and R.G. Tucker, 11th Annual Symposium of the Association of Senior Engineers, March 1974. Also presented at AIAA/SNAME, San Diego, Cal. Feb. 25-28,1974.
GRAUL 67	"The Design and Construction of Metal Planing Boats", by T. Graul, and E.D. Fry. Proceedings of the Spring Meeting of SNAME, Montreal, Canada, 1967.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
HALL NOV, 62	REPORT NOT OBTAINED IN TIME FOR REVIEW								
HEATHER, MAR, 78	B	B	-	-	-	-	-	-	-
HOBBS, OCT, 72	REPORT NOT OBTAINED IN TIME FOR REVIEW								
HOLTYN SEPT, 67	REPORT NOT OBTAINED IN TIME FOR REVIEW								
HYDRONAUTICS, MAY, 67	-	-	-	-	C	C	-	C	-
HYDRONAUTICS, AUG, 68	-	-	C	C	-	-	-	-	-

A = 1st Class Material, Important to Program

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HALL
NOV 62
"Rudder Design for Planing Craft", by D. Hall, The Planimeter, Oct. and Nov., 1962, Published by the Society of Small Craft Designers, c/o Carl J. Schnepf, Jr., 2656 Manker Street, Indianapolis, Indiana 46203.

HEATHER
MAR 78
"Seakeeping and the Small Warship" by R.G. Heather, K. Nicholson, and M.J. Stevens. Symposium on Small Fast Warships and Security Vessels. RINA Paper No. 3, 9 March 1978. Comment: Reviews various tools, in the form of criteria and techniques. Shortcomings and suggestions for further work are made.

HOBBS
OCT 72
"Hydrodynamic Surface Selections for Optimum Performance in Planing Power Boat Applications", by B. W. Hobbs, #7006, NTIS(AD-755759), Oct. 1972.

HOLTYN
SEPT 67
"Status of Aluminum Small Boat Standards and Recommended Practices", by C.H. Holtyn, Southeast Section,SNAME, Sept.1967.

HYDRONAUTICS
MAY 67
"On the Motions of High Speed Planing Craft", by C.C. Hsu, ASDB 10-U3227F, Hydronautics, Inc., (AD658151), May 1967. Remarks: A study of the hydrodynamics and dynamics of high speed planing craft. An atempt is made to extend the airfoil analogy to planing surfaces in arbitrary motions.

HYDRONAUTICS
AUG 68
"Steady-State and Oscillatory Hydrodynamics of a 20 Degree Dead Rise Planing Surface", by R.J. Altmann, TR 603-2, ASDB 10-U07050M, (AD 683349), Aug. 1968, Hydronautics, Inc. Remarks: Presents the measured forces and moments obtained with the planar motion mechanism on an oscillating planing surface.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
JONES, APR, 73	B	B	-	-	-	-	-	-	-

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JONES
APR 73

"Development of a High Speed Rescue Boat", Cdr. E.L. Jones, Lt. P.B. Fontneau, and W. Buote, USCG presented to SNAME Spring Meeting, Lake Buena, Florida, April 2-4, 1973. Comment: The development of a unique, experimental, 26 foot, Motor Rescue Boat for the United States Coast Guard is described. The design incorporates a stepped planing hull forward with a hydrofoil supporting the stern while underway. Paper provides a brief history of the concept's development and limited testing of a prototype craft.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
KENNEDY, SEP, 73	NOT AVAILABLE IN TIME FOR REVIEW								
KIMON, 57	NOT AVAILABLE IN TIME FOR REVIEW								
KOELBEL, MAY, 66	B	B	-	-	-	-	-	-	-
" FEB, 71	NOT AVAILABLE IN TIME FOR REVIEW								

A = 1st Class Material, Important to Program

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KENNEDY SEPT 73 — "Static and Dynamic Stability of a Small Fourteen Foot Flat Bottom Boat as it Relates to Boating Safety", by Kennedy, SNAME New England Section, September 1973.

KIMON 57 — "The Planing Characteristics of an Inverted V Prismatic Surface with Minus 10 Degrees Deadrise", by P.M. Kimon, DTMB Rept.1076, 1957.

KOELBEL MAY 66 — "The Detail Design of Planing Hull Forms", by J.G. Koelbel, Jr., presented to SNAME Southeast Section Meeting, Miami, Florida, May 27, 1966.

KOELBEL 26 FEB 71 — "Bibliography on Power Boat Design", by J.G. Keolbel, Jr., Final Report, No. 120-1, Feb. 26, 1971, (AD 743966).

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
LIPPISCH, MAY, 70	B	-	-	-	-	-	-	-	-
LITTON, MAR, 72	-	-	-	-	-	C	-	-	-
LORD, 54	C	C	-	-	C	C	-	-	-

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LIPPISCH MAY 70	"Stepped Planing Boats, Some Full-Scale Test Results", by A.M. Lippisch and R.E. Colton, prepared for SNAME,T&R Report R-9, May 1970.
LITTON MAR 72	"Nonlinear Hydrodynamic Theory for Finite-Span Planing Surfaces", by Y.T. Shen, T.F. Ogilvie, Litton Ship Systems, Journal of Ship Research, Vo. 16 N1, pp 3-20, March 1972.
LORD 54	"Naval Architecture of Planing Hulls", by L. Lord, Cornell Maritime Press, Cambridge, Maryland, 1954.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
MALONEY,	SEPT,	71	B	B	-	-	-	-	-	-	-
MARTIN,	MAR,	78	-	-	-	A	-	A	-	-	-
MCGOWN,	JAN,	61	-	B	-	-	-	-	-	-	-
MEYER,	APR,	57	B	B	-	-	-	-	-	-	B
MICHIGAN U.,	JULY	69	-	-	-	-	-	B	-	-	-
MICHIGAN U.,	FEB,	70		NOT AVAI	LABLE	IN T	IME FOR	REVIEW			
"	NOV,	70		NOT AVAI	LABLE	IN T	IME FOR	REVIEW			
"	NOV,	71	-	-	-	-	B	B	-	-	-
"	FEB,	75		NOT AVAI	LABLE	IN T	IME FOR	REVIEW			
MILLWARD,	DEC,	76	-	-	C	-	-	-	-	-	-
MIT,	JAN,	68	-	-	-	B	-	B	-	-	-
MONARK,	JUL,	72	C	-	-	-	-	-	-	-	-
MOORE,		76	-	-	C	-	C	-	-	-	-

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MALONEY SEPT 71 — "Offshore Racing Powerboat Design and Development Symposium on Small Craft",RINA, 21 Sept. 1971.

MARTIN MAR 78 — "Theoretical Prediction of Porpoising Instability of High-Speed Planing Boats", by M. Martin, Journal of Ship Research, Vol.22, No.1, March 1978, pp. 32-53. Remarks: Theoretical method is derived for predicting trim angle and speed coefficient at the inception of porpoising of prismatic planing hulls. Damping characteristics are derived.

MC COWN JAN 61 — "The Seaworthiness Problem in High-Speed Small Craft", by S.C. McGown, SNAME New York Metropolitan Section, Jan. 24, 1961.

MEYER APR 57 — "Results of Standardization, Tactical, and Rough Water Trials on Five Aircraft Rescue Boats", by E.R. Meyer, DTMB No. 1108, April 1957.

MICHIGAN U. JULY 69 — "Instability of Planing Surfaces", by T.F. Ogilvie, RPT-026, ASDB 10-U06795M, (AD694491), July 1969. Remarks: Development of a mathematical analysis for the hydrodynamic problem of a two dimensional planing surface which is heaving.

MICHIGAN U. FEB 70 — "Calculation of Maneuverability of Fast Surface Ships", by G.V. Sobolev, University of Michigan, Feb. 1970.

MICHIGAN U. NOV 70 — "Theory of High-Aspect-Ratio Planing Surfaces", by Shen, Young-Tsun, University of Michigan, College of Eng., RPT No. 102, Nov. 1970.

MICHIGAN U. NOV 71 — "Small Craft Engineering Resistance Propulsion and Sea Keeping", by F.C. Michelsen, J.L. Moss, J. Koelbel, D. Savitsky, H. Apollonio, University of Michigan, College of Engineering, Report No. 120, Oct. 1971.

MICHIGAN U. FEB 75 — "A Study of Planing Catamaran Hull and Tunnel Interactions", by T.J. Sherman, P.A. Fisher, University of Michigan, Final Report #011073-1, Feb. 1975.

MILLWARD DEC 76 — "The Effect of Wedges on the Performance Characteristics of Two Planing Hulls", by A. Millward, University of Liverpool, England. Presented to Jr. of Ship Research, Vol.20, No.4, December 1976, pp. 224-232. Comment: Water channel resistance tests.

MIT
JAN 68

"Stability of the Amphibious Craft LVTP-X12 in Waves and Surf", by R.W. Patterson, ASDB 10-U03013M, (AD667608), Jan. 1968. Remarks: Lateral mass and damping coefficients are shown as a function of frequency for several speeds in deep, shoal, and sloped bottom waters.(Massachusetts Insti. of Tech.)

MONARK
JULY 72

"Design and Analysis of Modern High Speed Catamarans", by Ed Fry, T. Graul, Monark Shipyard, Inc., Marine Technology, V.9 N3, July 1972, pp345-357.

MOORE
76

"Cambered Planing Surfaces for Stepped Hulls-Some Theoretical and Experimental Results", by Moore, W.L., DTNSRDC Report No. 2387, 1976.

SIT
AUG 76

"One Third Octave Band Accelerations Just Forward of the LCG for Full Scale CPIC Head Sea Tests", by Clarke Walker and Daniel Savitsky, Davidson Laboratory, RPT SIT-DL-76-1907

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
NAS, JAN, 62	-	-	-	-	C	-	-	-	-
NASA, JUN, 58	-	-	B	-	-	-	-	-	-
NAVSEC, OCT, 68	-	-	-	-	C	C	-	-	-
" OCT, 75	-	B	-	-	-	B	-	-	-
" MAR, 76	B	B	-	-	-	-	-	-	-
NAVSEC, JAN, 77	-	-	-	-	C	-	-	-	-
" MAR, 77	-	-	-	-	C	-	-	B	-
NICKUM, MAR, 77	-	-	-	-	-	-	-	A	-
NIOTC, AUG, 70	-	B	-	-	-	-	-	-	-
NPRDC, JUNE, 76	-	-	-	-	-	C	-		-
NSWC, AUG, 75	-	B	-	-	-	-	-	-	-

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NAS
JAN 62
"New Types of Surface Ships", National Academy of Sciences, ASDB 10-C00599M, (AD 329493), Jan. 1962. Remarks: Investigates technical characteristics of several "unusual" types of surface and near-surface ships.

NASA
JUNE 58
"High-Speed Hydrodynamic Characteristics of a Flat Plate and 20 Degree Dead-Rise Surface in Unsymmetrical Planing Conditions", by D. Savitsky, R.E. Prowse, D.H. Lueders, Tech. Note 4187, National Aeronautics and Space Administration, ASDB 10-U07067, (AD203279L), June 1958. Remarks: Results of an investigation to obtain the wetted areas, the three components of planing forces and the three components of moments acting on a zero and 20 degree dead rise surface in high speed unsymmetrical planing conditions are presented.

NAVSEC
OCT 68
"Outline of Proposed Program for Research and Development to Support US Navy Small Craft", Naval Ship Engineering Center, ASDB 10-U03581LF, Oct. 1968. Remarks: Presents a program to provide technical information in all areas of design, recognizing the technical dificiencies which exist and which must be corrected if effective military-oriented planing craft are to be built.

NAVSEC
OCT 75
"Active Fin Foll Stabilization Effectiveness on a 65' Torpedo Retriever Boat (TRB)", by Shields and Foster, NAVSEC Norfolk, Report 6660-20, 10 Oct. 1975.

NAVSEC
MAR 76
"Technical Evaluation of Coastal Patrol and Interdiction Craft (CPIC-X) Part I, Part II", (2 volumes), ASDB 10-001069, Naval Ship Engineering Center, RPT -6660-018, March 1976.

NAVSEC
JAN 77
"Procedures Manual - Dynamic Stability Analysis for U.S. Navy Small Craft", by J.G. Koelbel, NAVSEC Norfolk Virginia, Report No. 23095-1, Jan. 1977.

NAVSEC
MAR 77
"SEA KNIFE Model Seakeeping Data and One-Third Octave Band Accelerations", by D.W. Hankley, Naval Ship Engineering Center, Report No. 6660-29, March 1977.

NICKUM
MAR 77
"An Evaluation of Intact Stability Criteria", by G.C. Nickum, presented at SNAME Pacific Northwest Section Meeting, March 5, 1977. Comment: Coast Guard and Navy intact stability criteria which were in existence in 1952 are described. The evolution of the IMCO criteria for fishing vessels and for all other vessels under 100m (328 ft) in length and of the Coast Guard criteria for offshore supply vessels and towing vessels is described. The conclusion is reached that these criteria properly applied are adequate to ensure stability for seagoing vessels.

TEALE
"High Speed Motor Boats", by John Teale, Nautical Publishing

NIOTC AUG 70	"Vosper Mini-Fin System", by T.F. Booker, Naval Inshore Operations Training Center, ASDB 10-U07720M, Aug. 1970. Remarks: Contains sketches of the modifications to the Vosper Mini-Fin shaft for ease of removal or installation and test results obtained after the installation of a more sensitive gyro in a MK I patrol craft fast (PCF) roll stabilization system.
NPRDC JUNE 76	"Preliminary Review of Motion Stabilization Techniques for Consideration in Landing Vehicle Assault Design", by W.J. Stinson, Naval Personnel Research and Development Center, ASDB 10-U08640, June 1976. Remarks: Describes several methods.
NSWC AUG 75	"Patrol Boat Roll-Fin Stabilization Weapon Effectiveness Study Report", Naval Surface Weapons Center, DG-20:8/12, ASDB 10-U08117M, August 1975. Remarks: Final report on tests and analysis of 20MM weapon effectiveness on a 65-foot torpedo retriever boat with roll-fin stabilization activated and inactive in various sea states.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
OPTEVFOR, MAR, 74	B	B	-	-	-	-	-	-	-
ONR, NOV, 70	-	-	-	-	C	-	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

USCG "Standards Analysis Powering/Performance Evaluation Using

OPTEVFOR MAR 74	"Project Plan for Project O/S 234 (65-FT PB MK III OPEVAL)", Operational Test and Evaluation Force, ASDB 10-U07531M, March 1974. Remarks: Presents the COMOPTEVFOR Project plan to conduct an operational evaluation of the 65-ft. patrol boat MK III, and determine its operational suitability for service use.
ONR NOV 70	"Theory of High Aspect Ratio Planing Surfaces" by Young-Tsun Shen for Office of Naval Research, Department of Naval Architecture and Marine Engineering, University of Michigan, Publication No. 102, Nov. 1970.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
PAYNE, FEB, 74	C	C	B	B	B	B	-	-	-
PAYNE, APR, 74	-	-	-	-	-	A	-	B	-

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PAYNE FEB 74	"Supercritical Planing Hulls", by P.R. Payne, Society of Naval Architects and Marine Engineers, ASDB 10-U05073M, Paper No.74-333, Feb. 1974. Remarks: A paper which presents design approaches to devise new planing hull forms hwich avoid the system of pounding. Includes experimental data, gayle and sea knife boat designs.
PAYNE APR 74	"Coupled Pitch and Heave Porpoising Instability in Hydrodynamic Planing", by P.R. Payne, Journal of Hydronautics, Vol. 8, No. 2, April 1974, ASDB 10-U07065M. Remarks: An analysis of porpoising instability in planing boats. Identifies causes and offers solutions. An analysis of porpoising instability (A form of longitudinal instability characterized by an unstable coupling between heave and pitch degrees of freedom) in planing craft is discussed.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
RAE, SEPT, 33	-	-	-	-	-	B	-	C	-
ROPER, SEPT, 76	B	-	-	-	-	-	-	-	-

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C = Useful but Nonessential to Program

WALD "A Procedure for the Approximate Cal...

RAE
SEPT 33

"Stability on the Water of a Seaplane in the Planing Condition", Royal Aircraft Establishment, ARC, TR Vol. 42, by H. Glauert and W.G.A. Perring, Sept. 1933.

ROPER
SEPT 76

"Planing Power Boat Test Code", by J.K. Roper for Panel H-12 (Planing Boats) of Hydrodynamic Committee of SNAME Code C-6, Sept. 1976.

WYLE

"Standards Analysis Powering/Performance

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
SAVITSKY,	MAY,	66	-	-	-	B	-	-	-	-	-
"	OCT,	71	NOT AVAILABLE IN TIME FOR REVIEW								
SHARPLES	MAR,	72	NOT AVAILABLE IN TIME FOR REVIEW								
SHEN,	MAR,	72	-	-	-	-	C	-	-	-	-
SHIPPS,	SEPT,	76	B	B	-	-	-	-	-	-	-
SIT,	MAY,	54	-	-	C	-	C	-	-	-	-
"	JAN,	64	-	-	-	-	C	-	-	-	-
"	APR,	68	-	-	-	B	-	B	-	-	-
"	NOV,	69	-	-	-	B	-	-	-	-	-
"		70	-	-	-	-	C	-	-	-	-
SIT,	MAR,	71	-	-	-	B	-	-	-	-	-
"	OCT,	73	-	-	B	B	-	-	-	-	-
"	JAN,	74	NOT AVAILABLE IN TIME FOR REVIEW								
"	SEPT,	75	-	-	-	B	-	-	-	-	-
"	OCT,	75	-	-	B	-	B	B	-	-	-
SIT,	OCT,	75	-	-	B	B	-	-	-	-	-
"	NOV,	75	-	-	B	B	-	-	-	-	-
"	APR,	76	-	-	B	B	-	-	-	-	-
"	AUG,	76	REPORT UNOBTAINABLE FOR REVIEW								
"	FEB,	77	-	-	A	A	-	-	-	-	-

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
SNAME,	70	B	B	-	-	-	-	-	-	-
"	76	-	-	-	-	-	-	-	C	-
SUGAI,	64	NOT AVAILABLE IN TIME FOR REVIEW								

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SAVITSKY MAY 66 — "On the Seakeeping of Planing Hulls" by Daniel Savitsky, SNAME Paper, Southeast Section Meeting, May 1966.

SAVITSKY OCT 71 — "Small Craft Behavior in a Seaway", by Daniel Savitsky, contained in University of Michigan, Department of Naval Architecture, Report 120, Oct. 1971.

SHARPLES MAR 72 — "Small Patrol Craft", by A.K. Sharples. RINA, Occasional Meeting of RINA March 1972. Publication No. 1, Small Craft Group.

SHEN MAR 72 — "Nonlinear Hydrodynamic Theory for Finite-Span Planing Surfaces", by Shen and Ogilvie, Jr. of Ship Research, March 1972.

SHIPPS SEPT 76 — "Hybrid Ram-Wing/Planing Craft--Today's Raceboats, Tomorrow's Outlook", by Shipps, (SNAME/AIAA), SY Sept 1976.

SIT MAY 54 — "Hydrodynamic Study of the Chines-Dry Planing Body", by J.D. Pierson, D.A. Dingee, J.W. Neidinger, Stevens Institute of Technology, RPT-492, ASDB 10-U06793M, (AD045328). Remarks: Presents both theoretical and experimental aspects of the pressure distribution and load on a chines-dry, prismatic, vee-shaped, planing body.

SIT JAN 64 — "Hydrodynamic Design of Planing Hulls", by Daniel Savitsky, presented at SNAME New York Metro. Section Meeting, Jan. 1964.

SIT APR 68 — "On the Seakeeping Performance of Planing Hulls", by Daniel Savitsky, Stevens Institute of Technology. Reported in Marine Technology April 1968. Remarks: Although this paper refers to straight line motion, and deals with pitch and heave stability, it provides excellent background analysis of the behavior of planing craft in head seas.

SIT NOV 69 — "Systematic Study of the Rough-Water Performance of Planing Boats", by G. Fridsma, Stevens Insti. of Tech., ASDB 10-U06093M, SIT-DL-1275, Nov. 1969.

SIT 70 — "Notes on Characteristics of Planing Hulls with Flaps", by Angeli and Blount, Stevens Institute of Tech., SIT,.Note 775, April 11, 1970.

SIT MAR 71	"Systematic Study of the Rough-Water Performance of Planing Boats (Irregular Waves-Part II)", by G. Fridsma, SIT-DL-71-1495, ASDB 10-U03323, (AD728788), March 1971. Remarks: Presents the results of tests conducted on a series of prismatic planing boat models operating in irregular waves, to study the effects of deadrise, trim, loading, speed, length-beam ratio, bow section shape and sea state on performance.
SIT OCT 73	"Smooth-and Rough-Water Tests of Three Versions of a 65-ft MK 3 Patrol Boat", by J.A. Mercier, R.L. Van Dyck, SIT-DL-73-1704, Stevens Institute of Tech., ASDB 10-U07819, Oct. 1973. Remarks: Presents the smooth and rough water tests of three 1/14 scale model 65-ft MK 3 patrol boats. The differences between the hulls is the deadrise angle at and near the transom. Prepared for Naval Ship Systems Command.
SIT JAN 74	"Maneuvering Performance of High Speed Ships and Catamarans", by H. Eda, Stevens Institute of Tech., SIT-DL-74-1626, ASDB 10-U06555M, Jan. 1974.
SIT SEPT 75	"Recreational Craft Performance Study", by R.I. Hires, Stevens Inst. of Tech, SIT-DL-75-1850, CG RPT CG-D-7-76, Sept. 1975. Remarks: Model heave and pitch response at zero forward speed in head and following regular and irregular waves reveals pooping conditions.
SIT OCT 75	"Calm Water Equilibrium, Directional Stability and Steady Turning Conditions for Recreational Planing Craft", by C.J. Henry, Stevens Inst. of Tech., SIT-DL-75-1851, CG-D-8-76, Oct. 1975.
SIT OCT 75	"Preliminary Hydrodynamic Model Tests of Several LVA Planing Hull Concepts", by D. Savitsky, E. Numata, M. Chiocco, Stevens Insti. of Tech., SIT-DL-75-1840, ASDB 10-U07664, Oct. 1975. Remarks: Exploratory Study Using 1/12th scale models; vee-bottom hulls each with transom flap adjustable up to positive 15 degrees; chine flaps also tested; smooth and rough (SS-2) water results provided by graphs and tables.
SIT NOV 75	"Procedures for Hydrodynamic Evaluation of Planing Hulls", by D. Savitsky, and P.W. Brown, Stevens Inst. of Tech., SIT-DL-75-1859, Nov. 1975.
SIT APR 76	"Hydrodynamic Model Evaluation of a Series of Planing LVA Concepts , by P.W. Brown, Stevens Insti. of Tech. SIT-DL-76-1880, ASDB 10-U07814, April 1976. Remarks: Test results for four different hulls fitted with bow, transom and chine flaps.

SIT AUG 76	"One Third Octave Band Accelerations Just Forward of the LCG for Full Scale CPIC Head Sea Tests", by Clarke Walker and Daniel Savitsky, Davidson Laboratory, RPT SIT-DL-76-1907, Aug. 1976, (Confidential)
SIT FEB 77	"Summary Report of Model Tests of a Coastal Patrol and Interdiction Craft", by D. Savitsky, E. Numata, Stevens Insti. of Tech., SIT-DL-77-1939, ASDB 10-C00759L, Feb. 1977. Remarks: Summarizes the hydrodynamic model test programs for CPIC in a chronological order. Pertinent test results are presented and their importance to the design process is described.
SNAME 70	"Stepped Planing Boats, Some Full Scale Test Results", Panel H-12, T&R, No. R-9, 1970.
SNAME 76	"Planing Power Boat Test Code", Panel H-12, T&R No. C-6, 1976.
SUGAI 64	"On the Maneuverability of the High Speed Boat", by Sugai, Kazuo, Bureau of Ships Translation No. 868, AD-463-211, 1964.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
TEALE, 69	B	-	B	-	B	-	-	-	-
TORO, 69	NOT AVAILABLE IN TIME FOR REVIEW								
TRYNULOV, APR, 76	-	-	-	-	B	-	-	-	-

A = 1st Class Material, Important to Program

B = Supporting Material

C = Useful but Nonessential to Program

TEALE 69 — "High Speed Motor Boats", by John Teale, Nautical Publishing Co., 1969.

TORO 69 — "Shallow Water Performance of a Planing Boat", by A. Toro Symposium on Small Craft Technology, SNAME Southeast Section, 1969.

TRYNULOV APR 76 — "Influence of Hull Form on the Transverse Stability of Planing Craft", by Nicolai Trynulov and Vladimir Marchev, Hovering Craft and Hydrofoil Magazine, April 1976, Vol.5, No.7, p.36.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
USCG	MAR, 74		NOT AVAILABLE IN TIME FOR REVIEW							
"	SEPT, 74	A	A	-	-	B	B	A	B	C
"	APR, 76	-	-	-	-	B	-	-	-	-

A = 1st Class Material, Important to Program

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USCG MAR 74	"Standards Analysis Powering/Performance Evaluation Using Test Course Methods, Vol. I - Research Report", DOT Report No. CG-D-126-75, March 1974.
USCG 30 SEPT 74	"A Detailed Study of Power and Load Related Boating Accident Data", DOT Report No. CG-D-29-75, Sept. 30, 1974.
USCG APR 76	"Hydrostatics and Equilibrium Characteristics Computer Program for Recreational Boats",by P. Secrest, U.S.C.G. R & D Center, Groton, Con. Report No. CG-D-65-76, AD/A-033-609, April 1976. Comment: Report is intended to serve as complete documentation of a versatile computer program which calculates hydrostatics and equilibrium characteristics. It differs from other hydrostatics programs in its applicability to odd-shaped boats and in its capability of performing equilibrium calculations. Program explanation, user guide, program listings, program flow charts, and a sample run are included.

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VOSPER	MAR,	78	B	B	-	-	-	-	-	-	-
"	MAR,	78	-	-	A	A	-	-	-	B	-
VOSSERS,	NOV,	60	-	-	-	C	-	-	-	-	-

A = 1st Class Material, Important to Program

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VOSPER MAR 78	"General Design Aspects of Fast Warships", by A.L. Dorey, Vosper Thornycroft, "Symposium of Small Fast Warships and Security Vessels, RINA, March 1978.
VOSPER MAR 78	"An Experimental Investigation on the Roll Stability of a Semi-Displacement Craft at Forward Speed", bv K.R. Suhrbier of Vosoer Thornycroft, presented at the "Symposium of Small Fast Warchips and Security Vessels", RINA, March 1978.
VOSSERS 17 NOV 60	"Experiments with Series 60 Models in Waves", by G. Vossers, W.A. Swaan, H. Rijken, SNAME, Nov. 17-18, 1960.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
WALD,	MAY,	78	-	-	-	-	-	C	-	-	-
WANG,	APR,	71	-	-	C	-	C	-	-	-	-
WITTER,	DEC,	67	B	A	-	B	-	-	-	-	B
WYLE	SEPT,	72	-	-	-	-	-	-	-	B	-
"	JAN,	73	-	-	-	-	-	-	-	C	-
WYLE,	MAR,	73	B	-	-	-	C	-	-	C	-
"	JUNE,	73	C	C	-	-	-	-	-	C	-
"	OCT,	73	B	-	-	-	-	-	-	-	-
"	MAR,	74	-	A	-	-	-	-	B	B	-
"	MAY,	75	C	C	-	-	-	-	-	C	-

A = 1st Class Material, Important to Program

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WALD MAY 78 — "A Procedure for the Approximate Calculation of the Pressure Distribution on Curved Planing Surfaces", by Q.R. Wald, Rohr Marine, Inc. Report No. E002297, May 1978.

WANG APR 71 — "Three-Dimensional Planing at High Froude Number", by D.P. Wang and P. Rispin, SNAME Paper, April 8, 1971.

WITTER DEC 67 — "Rescue Boat Development", by R.W. Witter, CDR, USCG, ASNE, Naval Engineers Journal, December 1967, pp 937-945.

WYLE SEPT 72 — "U.S. Coast Guard Safe Powering Test Procedure", by Wyle Laboratories for USCG, Report No. AD-758-428, Sept. 1972. Comment: Report describes in detail a Safe Powering Test Procedure for outboard boats. The Safe Powering Test Procedure is designed to determine whether or not a given boat complies with the Maximum Allowable Horsepower as specified in the Boating Safety Act of 1971, and the Rules and Regulations in the Federal Register, Vol. 37, No. 151, dated August 4, 1972. The specification of Maximum Allowable Horsepower is determined according to the length of the boat, the width and height of the transom, the characteristic hull shape and whether or not the particular boat has remote steering.

WYLE JAN 73 — "Safe Powering Test Procedure Development Report", by Wyle Laboratories. for USCG, Report No. 58206-2 (DR) Jan. 1973. Comment: Provides background to development of small boat test procedures.

WYLE MAR 73 — "Analysis of Physical Measurement Requirements and Methods for Recreational Boats" by Wyle Laboratories for USCG, Report No. CG-D-5-73, March 1973.

WYLE JUNE 73 — "Flotation Standards Analysis Research and Development Report", by J.A. Cockburn, C.A. Michalopoulos, RPT-CG-D-10-74, ASDB 10-U08394F, Wyle Laboratories, (AD767791), June 1973. Remarks: An analysis of three flotation standards by comparing test results conducted on a john boat, bass boat and 18 ft. i/o boat. These tests were carried out to investigate upright and level flotation and the stability of swamped boats.

WYLE OCT 73 — "Recreational Boat Developmental Test Program, Developmental Testing Volume I: Phase I Report", by Wyle Laboratories for USCG, Report No. CG-D-40-74, October 1973. Comment: Presents developmental testing program, test methods, instrumentation for small boat dynamic tests at zero forward speed.

WYLE MAR 74 — "Standards Analysis Powering/Performance Evaluation Using Test Course Methods, Volume I- Research Report", by Wyle Laboratories for USCG, Report No. CG-D-126-75, March 1974. Comment: Full scale experimental programs aimed at obtaining data/criteria for a "performance" method of determining maximum horsepower (speed) at which a small boat will not exhibit "instability" when subjected to a severe maneuver. Includes evaluation of 96 boats of length less than 26 feet.

WYLE MAY 75 — "Level Flotation Standards Analysis Research and Development Report", by C. Sautkulis, et al, Wyle Laboratories for USCG. Report No. CG-D-112-75, AD-A014-645, May 1975.

BACKGROUND STUDY OF INTACT STABILITY STANDARDS
FOR DYNAMICALLY SUPPORTED CRAFT

VOLUME VI

A CATEGORIZED GENERAL BIBLIOGRAPHY OF
SHIP AND SMALL CRAFT STABILITY RELATED REPORTS

by

David R. Lavis
Edward G.U. Band
Alexander W. Fowler
Edgar D. Hoyt

Task 1 Report
Contract No. DOT-CG-806510-A

for

U. S. Department of Transportation
United States Coast Guard
Office of Research and Development
Washington, D. C. 20590

INTRODUCTION

This document contains a general bibliography of Ship and Small Craft stability related reports. It is one of a series of bibliographies which have been prepared for the United States Coast Guard's (USCG's) investigation of the stability of dynamically supported craft. The other bibliographies in this series are:

- A Bibliography of Amphibious Air Cushion Vehicle (ACV) Stability Related Reports.
- A Bibliography of Rigid Sidehull Surface Effect Ship (SES) Stability Related Reports.
- A Bibliography of Hydrofoil Craft Stability Related Reports.
- A Bibliography of Planing Craft Stability Related Reports.

Entries in the bibliography have been made in alphabetical order using the Author's company (or affiliation) or Author's last name if his company and affiliation are unknown or are less descriptive of the source.

A "Reference Evaluation and Subject Index" table is provided for each group of alphabetical entries. These tables provide an indication of the relevance or value of each document to the study of craft stability and also places each within one of nine separate subject categories. The value of each document to the subject of craft stability has been indicated by assigning a letter A, B. or C to each entry using the following classification.

A: First Class Material, Important to Program

B: Supporting Material

C: Useful but not Essential to Program

The subjects into which each document has been categorized are defined as follows:-

<u>Full Scale Operations, Static</u>

Report contains full scale information of a non-dynamic nature, e.g. static stability testing, (craft stationary and/or at forward speeds) and/or general steady state operational behavior, including operators overall assessments.

<u>Full Scale Operations, Dynamic</u>

Report contains full scale information on craft dynamic behavior, e.g. seakeeping, maneuvering, response transients, dynamic stability, or dynamic behavior in general including operators overall assessments.

Model Tests, Static

Report contains model test information of a non-dynamic nature, e.g. craft and component static stability testing (model stationary and/or at forward speeds), calm water resistance tests, including test results and/or descriptions of test techniques.

Model Tests, Dynamic

Report contains test information on model dynamic behavior, e.g. towing tank or free (maneuvering) model dynamic tests, dynamic transient tests, seakeeping including surf tests, results and/or description of test techniques.

Analytical Studies, Static

Report contains analytical studies related to craft static stability.

Analytical Studies, Dynamic

Report contains analytical studies related to craft dynamic stability, e.g. analyses of craft capsizing, seakeeping, maneuvering, motion response, acceleration response, hull slamming, survivability.

Accident Reports

Report contains a specific account of, comment on, or analysis of a craft stability related accident which has resulted in property damage, personal injury or loss of life.

Criteria

Report contains information on craft stability related criteria, e.g. specific criteria or standards, design guidelines or practices for adequate craft stability, human tolerance to craft motions, safety limits, regulatory issues and standards.

Environment

Report contains information concerning weather conditions, e.g. wind, sea state, icing etc. Report may also contain information on forcast and hindcast techniques, and probabilistic description of severity.

The bibliography has been compiled from a fairly comprehensive search of the following sources.

1. The National Technical Information Service (NTIS)
2. The Royal Institution of Naval Architects (RINA)
3. Society of Naval Architects & Marine Engineers (SNAME)
4. North Carolina Science & Technology Research Center
5. U.S. Naval Academy Library
6. David W. Taylor Naval Ship Research & Development Center (DTNSRDC)

7. American Institute of Aeronautics & Astronautics (AIAA)
8. American Society of Mechanical Engineers (ASME)
9. U.S. Department of Transportation (DOT)
10. Engineering Index Inc. New York, N.Y.
11. Maritime Research Information Service (MRIS)
12. The British Ship Research Association (BSRA)
13. National Aeronautics & Space Administration (NASA)
14. Hovering Craft & Hydrofoil, Kalergi Publications
15. Robert Trillo Ltd. Hampshire, U.K.
16. Band, Lavis & Associates, Inc., Severna Park, MD.

GLOSSARY

ABS	American Bureau of Shipping
ABYC	American Boat and Yacht Council
ATTC	American Towing Tank Conference
DTNSRDC	David W. Taylor Naval Ship Research & Development Center
HYDRONAUTICS	Hydronautics, Inc.
IMCO	Inter-governmental Maritime Consultative Organization
MARITECH	Maritech, Inc.
MIT	Massachusetts Institute of Technology
MOD (UK)	Ministry of Defence(Navy), United Kingdom
MRIS	Maritime Research Information Service
MCAC	McDonnell Douglas Astornautics Co.
NASA	National Aeronautics and Space Administration
NAVSEA	Naval Sea Systems Command
NAVSEC	Naval Ship Engineering Center
NMI	National Maritime Institute (United Kingdom)
NMRC	National Maritime Research Center
NPL	National Physical Laboratory, England
NPS	Naval Postgraduate School
NSMB	Netherlands Ship Model Basin
NTIS	National Technology Information Service
NUF	Norwegian University of Fisheries
NURDC	Naval Undersea Research and Development Center
RINA	The Royal Institution of Naval Architects
SIT	Stevens Institute of Technology
SNAME	Society of Naval Architects and Marine Engineers
TRANSPORT,CA	Department of Transport, Canada
UC, L.	University College, London
ULI	Underwriters Laboratories, Inc.
USCG	United States Coast Guard
VPI	Virginia Polytechnic Institute
WALKER	Walker (Norman K.) Associates, Inc.
WYLE	Wyle Laboratories

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
ABICHT,	SEPT, 72	-	-	-	B	-	B	-	B	C
ABKOWITZ,	69	-	-	-	-	-	C	-	-	-
ABS,	79	-	-	-	-	-	-	-	C	-
"	-	-	-	-	-	-	-	-	C	-
ABYC	79	-	-	-	-	-	-	-	B	-
AMY	76	B	B	B	B	B	B	-	B	-
ATTC,	AUG, 77	-	-	B	B	-	-	-	-	-

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ABICHT SEPT 72	"Ships Stability in Confused Seas (Die Sicherheit Der Schiffe im Nachlaufenden Unregelmaessignen Seegang)", by W. Abicht, Schiffstechnik, V.19, N97, Sept. 1972, pp 43-60, in German, Engineering Index, EI 73 010100. Remarks: The influence of ocean waves on rolling of ships is analyzed. The critical roll amplitude is investigated to determine the minimum amount of stability. An evaluation of data obtained with models is made.
ABKOWITZ 69	"Stability and Motion Control of Ocean Vehicles", by M.A. Abkowitz, MIT press, 1969.
ABS 79	"Rules for Building and Classing Steel Vessels", American Bureau of Shipping, 65 Broadway, New York, N.Y. 10006, 1979.
ABS	"Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways", American Bureau of Shipping, 65 Broadway, New York, N.Y. 10006.
ABYC 79	"Safety Standards for Small Craft", American Boat and Yacht Council, P.O. Box 806, 190 Ketcham Ave., Ammityville, N.Y. 11701.
AMY 76	"Development of Intact Stability Criteria for Towing and Fishing Vessels" by J.R. Amy, R.E. Johnson and E.R. Miller, SNAME Transactions, Vol. 84, 1976, page 75. Remarks: An experimental and analytical study of intact stability requirements for U.S. towing and fishing vessels is described. A literature survey determined what criteria are in use by various authorities, to judge the adequacy of intact stability of their fleets. The characteristics of the U.S. towing and fishing fleets in general were gathered, and 51 vessels were characterized in detail. Four models of representative vessels were built and tested in calm water and in regular waves. The calm-water tests studies towing vessels' tripping by their own power, and by the movement of their tow. The tests in waves took place in following, beam, and head waves, with the vessels running free or towing. The relationships between a vessel's power, handling, and proportions, and its probability of capsizing were studied. A set of stability criteria for use by the USCG is presented.
ATTC AUG 77	"Proceedings of the Eighteenth General Meeting of the American Towing Tank Conference - Vol. Three-Maneuvering Session Systems and Techniques Session", 23-25 August 1977, Annapolis. MD.

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REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
BAITIS,	SEPT,	72	-	C	-	-	-	C	-	-	-
BAUM,	JAN,	74	C	-	-	-	-	-	-	C	C
BOE,	JAN,	74	-	-	-	-	-	-	-	B	-
"	OCT,	75	-	-	-	-	-	-	-	A	-
BROOKS,		73	-	-	-	-	-	-	-	B	-
BROWN	JAN,	79	B	-	-	-	B	-	-	B	-
BUCK		74	C	-	-	-	-	-	-	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

BAITIS SEPT 72 — "Evaluation of Vosper Active Fin Roll Stabilizers", by A.E. Baitis, G.G. Cox, D. Wollaver, Third Ship Control System Symposium, Sept. 1972.

BAUM 31 JAN 74 — "The Assessment of the Requirements for Survival on the Great Lakes", by J.V. Baum, D.C. Doerschuk, J.M. Tierney, Final Rpt., 31 Jan. 1974, United States Coast Guard, CN-DOT-CG-23,223-A, (AD786662/7SL). Remarks: The report presents an assessment of the requirements for the survival of personnel associated with merchant vessel casualties on the Great Lakes.

BOE AUG 74 — "Reliability Engineering and Safety at Sea", by C. Boe and O.J. Tveit, IEEE Transactions on Reliability, VR23 N3, Aug. 1974, pp. 174-178. Remarks: This paper surveys the field of reliability as related to marine engineering. The problems in marine systems are characterized by availability and safety. Experience in dealing with marine equipment and systems has shown that the available techniques and methods of reliability engineering should be applied with care in marine engineering. Special attention should be paid to failure cause, mechanism, and mode. Some proven methods are discussed.

BOE OCT 75 — "Criteria for Safety at Sea", by C. Boe and A. Foleide, United States Coast Guard, Proceeding, Oct. 1975. Remarks: The purpose of this paper is to report from an investigation into risks to human life from shipping technology. The conclusions to be drawn may assist in establishing high-level safety criteria for shipping. The investigation comprises an attempt to measure safety at sea as it can be observed at present. Furthermore the investigation includes the study and utilization of methods and techniques for measuring and evaluation of risk levels.

BROOKS 73 — "The Coast Guard's Standards Program and Its Impact on Small Boat Design", by Brooks and Llana, SNAME Spring Meeting, 1973.

BROWN JAN 79 — "Stability at Large Angles and Hull Shape Considerations", by D.K. Brown, published in "The Naval Architect", RINA, January 1979.

BUCK 74 — "Performance Characteristics of High Performance and Advanced Marine (HIPAM) Surface Vehicles", by J. Buck, C.G. Kennell, N.R. Fuller, SNAME Chesapeake Section, Oct. 1974.

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CALIF. U.,	JAN,	72	-	-	-	B	-	-	-	-	B
"	NOV,	72	-	-	-	B	-	-	-	B	B
"	JUN,	73	-	-	-	B	-	B	-	B	B
"	DEC,	74	-	-	-	B	-	B	-	B	B
CLARKE,	MAY,	71	-	-	-	-	-	B	-	-	-
CLEARY,		75	-	-	-	-	-	-	-	B	-
"	OCT,	76	-	-	-	-	-	-	-	B	-
CONOLLY,	MAR,	68	-	-	-	-	-	C	-	-	-
COX,		75	-	C	-	C	-	C	-	-	-
"	NOV,	77	-	-	-	-	-	-	-	A	-

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CALIFORNIA U.
JAN 72

"Capsizing Experiments with a Model of a Fast Cargo Liner in San Francisco Bay", by M.R. Haddara, S. Kastner, J.R. Paulling, L.F. Magel, L. Perez y Perez, California University, Berkeley, Department of Naval Architecture, Final Rpt, Jan. 1972, CN-DOT-CG-84549-A, NTIS PB-212457. Remarks: A program of model testing in the open waters of San Francisco Bay is described in the report. This program had, as its objective, the study of ship motion problems including capsizing and control performance in a heavy seaway. The equipment, testing techniques, and data acquisition and processing are described. Some preliminary results from simple statistical analyses of the data are also given. Observations of the behavior of a model of the AMERICAN CHALLENGER class of cargo ships have enabled three categories of capsizing to be distinguished: low cycle resonance, pure loss of stability, and broaching. All three modes are strongly influenced by the reduction of the ship's stability when a wave crest is amidships, and all are most likely to occur in a following to quartering seaway.

CALIFORNIA U.
NOV 72

"Experimental Studies of Capsizing of Intact Ships in Heavy Seas", by J.R. Paulling, S. Kaestner, S. Schaffran, California University, Berkeley, Dept. of Naval Architecture, Tech.Rpt., Nov. 1972, CN-DOT-CG-845,49-A, (AD-753653). Summary: Experiments intended to shed light on the mechanism of the capsizing of an intact ship in heavy seas are described. These experiments were carried out in San Francisco Bay using a radio controlled model of a cargo liner. Three capsizing modes were observed: low cycle resonance, pure stability loss, and broaching. All modes are seen to be strongly influenced by the effect of quartering or following seas in attenuating the ships' stability. Some conclusions are reached concerning the value of such experiments in predicting minimum stability standards. (Author)

CALIFORNIA U.
JUNE 73

"Capsizing Experiments in San Francisco Bay", by S.J. Chou, L.F. Magel, O.H. Oakley, Jr., J.R. Paulling, P.D. Wood, California University, Dept. of Naval Architecture, 1973 Annual Report, June 1973, CN-DOT-CG-84,549-A. Summary: The report describes accomplishments for the period May 1, 1972 - June, 1973, under a research program entitled, 'Stability and Ship Motion in a Seaway'. The principal objective of this program is the study of extreme ship motion in waves, particularly in regard to survivability against capsizing. The research includes a program of experiments conducted with free-running radio controlled ship models in the open waters of San Francisco Bay, and a theoretical part involving studies of large amplitude motion and the extrapotation of current research results to real ship experience. (Modified author abstract)

CALIFORNIA U. DEC 74	"Ship Motions and Capsizing in Astern Seas", by S.J. Chou, O.H. Oakley, Jr., J.R. Paulling, R. Van Slyke, P.D. Wood, California University, Dept of Naval Architectural, Final Rpt. USCG-D-103-75, Dec. 1974, CN-DOT-CG-84549-A, (AD-A012 495/8GA). Summary: An analytical and experimental study of ship motions and capsizing in extreme seas is presented. The analysis of linear and quasi-linear one-dimensional roll models has revealed motion anomalies not apparent from the usual linearized ship motion theory. Extensive tests have been conducted using two radio-controlled models in the wind generated seas of San Francisco Bay. Directional Spectra were computed, using a variety of techniques, form the wave measurements by an array of wave gages. Comparisons of the experimentally determined motions and a linear strip theory prediction are presented. A time domain numerical simulation program for motions and capsizing has been used to investigate motions in a variety of wave group configurations. The results show good agreement with observed capsizing phenomena and have revealed a number of important characteristics associated with large geometry changes in waves.
CLARKE MAY 71	"New Non-Linear Equation for Ship Maneuvering", by D. Clarke, British Ship Research Association, International Shipbuilding Progress, V.18 N201, May 1971, pp. 181-197. Summary: A nonlinear equation in terms of yaw rate is developed, the solutions of which are in good agreement with those of the usual cross-coupled nonlinear equations. There is enough flexibility in the form of the new equations to deal with the case of dynamically unstable ships, and the inclusion of nonlinear damping terms allow the shape of the phase portraits to be altered. It is quite feasible that this equation could be used to give a realistic simulation of ship maneuvers.
CLEARY 75	"Load Lines--The Lever of Safety", by William A. Cleary, Jr., TR 1975.
CLEARY OCT 76	"The International Convention for the Safety of Fishing Vessels--1977 and What it Means to the United States", by William A. Cleary, Jr., LS-HR Oct. 1976.
CONOLLY MAR 68	"Rolling and its Stabilization by Active Fins:, by J.E. Conolly, RINA, Marcy 1968.
COX 75	"State-of-the-Art for Roll Stabilizers", by G.G. Cox and R.F. Lofft, 14th International Towing Tank Conference, Report of Seakeeping Committee, Appendix 5, 1975.

COX NOV 77	"The Evolution of Safety Requirements for Dynamically Supported Craft", by J.M. Cox, published in Hovering Craft and Hydrofoil No. v1977, Vol. 17, No. 2, pp 27-37.

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REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
DAHLE,		79	–	–	–	–	–	–	B	B	–
DANAHY,	JAN,	68	C	C	–	–	C	C	–	C	–
DTNSRDC,	FEB,	67	–	–	–	–	–	–	–	B	–
"	MAR,	67	–	–	–	–	–	–	–	B	–
"	AUG,	75	–	–	–	–	–	–	–	–	B
DTNSRDC,	APR,	76	–	C	–	–	–	–	–	–	–
DUCANE,		73	B	B	B	B	B	B	–	C	C
"		–	C	C	C	C	C	C	–	C	C

A = 1st Class Material, Important to Program

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DAHLE 79 — "The Capsizing of M/S Helland-Hansen, The Investigation and Recommendations for Preventing Similar Accidents", by Emil Aall Dahle and Olav Kjaerland, RINA Paper No. 11, Spring Meetings 1979.

DANAHY JAN 68 — "Adequate Strength for Small High-Speed Vessels", by Danahy, AIAA/SNAME, Jan 1968.

DTNSRDC FEB 67 — "Effect of Vertical Vibration on the Well-Being of Personnel; Report on a Literature Review", by J.C. Townsend, DTNSRDC, ASDB 10-U09445, Feb. 1967.

DTNSRDC MAR 67 — "Final Report Effects of Vertical Vibration on the Well-Being of Surface Effect Ship Personnel: Literature Survey", by J.C. Townsend, ASDB 10-U09444F, March 1967. Remarks: Literature survey on human tolerance to vibration for application to SES ride quality criteria development.

DTNSRDC AUG 75 — "On Statistical Techniques for Predicting the Extreme Dimensions of Ocean Waves and of Amplitudes of Ship Responses", M. Saint Denis, DTNSRDC, SNAME, #3, Aug 1975. Summary: The usefulness is discussed of available statistical techniques for predicting the probable short-term maximum, or peak, dimensions of ocean waves and oscillatory ship responses as well as their probable long-term maximum, or extreme, values. The scope of the exposition includes expected values and dispersion about such values and applies to the treatment of light, moderate and heavy seaways and to ships modeled as linear, quasi-linear and nonlinear systems. At the present, only the combination of linear ships in light seas has been developed to the point that it can be usefully employed.

DTNSRDC APR 76 — "Control Response Trials of the Stable Semi-submerged Platform (SSP KAIMALINO)", by J.A. Fein and R.T. Waters. DTNSRDC Rept No. SPD-650-02. April 1976.

DUCANE 73 — "High Speed Small Craft", by P. Ducane, John Degraff, Inc., Fourth Edition Revised 1973.

DUCANE — "Fast Patrol Boats", by P. Ducane.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
FRASER, APR, 77	-	-	-	-	-	-	-	B	-

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FRASER
APR 77

"Stability of Inshore Fishing Vessels Under 80 Feet", by D.J. Fraser. Presented to Canadian Maritime Section of SNAME, April 20, 1977.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
GALE,		-	-	-	-	-	-	-	C	-
GAUCHER,	FEB, 67	-	-	-	-	-	-	-	B	-
GOLDBERG,*	NOV, 62	-	-	-	-	-	-	-	B	-
"	FEB, 74	-	-	-	-	-	-	-	B	-
*NAVSEC,	OCT, 75	CONTAINS ESSENTIALLY THE SAME MATERIAL								

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GALE APRIL 75	"Margins in Naval Surface Ship Design", by P.A. Gale. Naval Engineers Journal, April 1975.
GAUCHER FEB 67	"United States Coast Guard Stability Criteria", by P.C. Gaucher, Presented to the Gulf Section of SNAME, Feb. 1967.
GOLDBERG NOV 62	"Stability and Buoyance Criteria for U.S. Naval Surface Ships", by T.H. Sarchin and L.L. Goldberg. SNAME Transactions Vol. 70. Nov. 1962.
GOLDBERG FEB 74	"Current Status of U.S. Navy Stability and Buovancy Criteria for Advanced Marine Vehicles". by Goldbert, Tucker, AIAA/SNAME Paper No. 74-332, Feb. 1974. (See also NAVSEC OCT 75).

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
HADDARA, OCT, 74	-	-	-	-	-	B	-	-	-
HAMAMOTO, JUN, 73	-	-	-	-	-	B	-	C	-
HARRIS, SEPT, 76	-	-	C	-	-	-	-	-	-
HILL, JAN, 76	-	-	-	-	-	-	-	B	-
HIND	-	-	-	-	-	-	-	C	-
HOCKBERGER -	-	-	-	-	-	-	-	C	-
" -	-	-	-	-	-	-	-	C	-
HUTCHISON, OCT, 78	-	-	-	-	-	C	-	-	-
HYDRONAUTICS, FEB, 75	-	-	-	-	-	-	-	B	-
" JAN, 76	-	-	-	-	-	-	-	B	-
HYDRONAUTICS, JAN, 76	-	-	-	-	-	-	-	B	-

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HADDARA OCT 74	"Modified Approach for the Application of Fokker-Plank Equation to the Nonlinear Ship Motions in Random Waves" by M.R. Haddara, International Shipbuilding Progress. Vol.21. N242, Oct. 1974, pp 283-288. Summary: An anlaytical method for the study of transient behavior as well as the stationary solution of non-linear ship motion in random waves is presented. The problem of rolling motion of a ship traveling in oblique random waves is considered for the purpose of illustrating the method. The presence of nonlinear damping and restoration terms of general form is allowed.
HAMAMOTO JUNE 73	"On the Hydrodynamic Derivatives for the Directional Stability of Ships in Following Seas - Part 2", by M. Hamamoto. Journal of SNA of Japan, V. 133, June 1973, pp. 133-142, in Japanese. Summary: In order to estimate stability limit of the maneuver-ability of ships in following seas, an analytical method combining simplified potential flow theory and Froude-kriloff hypothese is developed to predict the course stability deriviatives of ship in regular waves.
HARRIS SEPT 76	"New Scale Model Test Facilities for Advanced High Performance Marine Vehicles", by Harris, Krachman, Souter, SNAME/AIAA, Sept. 1976.
HILL JAN 76	"Coast Guard Boating Safety and Yachtsmen", by Hill, USCG Panel, Jan. 1976.
HIND	"Stability and Trim of Fishing Vessels", by J.A. Hind, Fishing News (Books) Ltd., 110 Fleet Street, London, E.C.4., England.
HOCKBERGER SEPT 75	"The Impact of Ship Design Margins", by W.A. Hockberger, NAVSEC Concept Design Division, 6112-082-75, AD-A015 638/OWO, 1 Sept. 1975.
HOCKBERGER APRIL 76	"Ship Design Margins - Issues and Impacts", by W.A. Hockberger, ASNE, Naval Engineers Journal, April 1976.
HUTCHISON OCT 78	"Application of Seakeeping Analysis", by B.L. Hutchison, and J.T. Bringloe, Marine Technology, Vol. 15, No. 4, October 1978, pp 416-431.

HYDRONAUTICS FEB 75	"Evaluation of Current Towing Vessel Stability Criterion and Proposed Fishing Vessel Stability Criteria. Volume One", by E.R. Miller, G.C. Nickum, J.R. Rudnicki, B.J. Young, Hydronautics, Inc., Final Rpt., CN-DOT-CG-24656-A, (AD/A-006815/5ST). Summary: The results of the first, or formulation task, of a three-task study results of stability criteria for towing and fishing vessels for the USCG are presented. Included are a literature study, a fleet census and characterization, detailed stability calculations for 51 vessels, and the selection of models and test programs for task 2. Four models are selected and a proposed test program for towing vessel tripping and towing, and fishing vessel seakeeping are described. Volume one contains the literature search results, the fleet census and characterization, and the model and test program selection procedure. Volume two contains 51 vessel booklets, each presenting the characteristics and static and dynamic stability curves for a particular vessel.
HYDRONAUTICS JAN 76	"Evaluation of Current Towing Vessel Stability Criterion and Proposed Fishing Vessel Stability Criteria. Task 2. Tripping and Seakeeping Tests of Towing and Fishing Vessels", by M.G. Pepper and E.R. Miller, Hydronautics, Inc., Final TR-7311, Jan. 1976, USEC-D-3-76, CN-DOT-CG-24656-A,(AD-A019 830/9GA). Summary: Results of a model tests program, the second task of a three task study of stability criteria for towing and fishing vessels, are presented in this report. The tests covered both tripping and seakeeping of four models. The models were selected form a detailed study of fifty-one towing and fishing vessels carried out in Task One. A discussion of the testing methods and a limited analysis of the data are included.
HYDRONAUTICS JAN 76	"Evaluation of Current Towing Vessel Stability Criterion and Proposed Fishing Vessel Stability Criteria. Task III", by E.R. Miller and V. Ankudinov, Hydronautics, Inc., Final Rpt, TR-7311-3, Jan. 1976, USCG-D-4-76, CN-DOT-CG-24656-A. Summary: This report presents the results of the third and last task in the study of intact stability criteria for towing and fishing vessels for the USCG. This third task was the analysis, development, and evaluation of intact stability criteria based on the model testing and analysis work done under tasks one and two. Criteria are proposed for the following operating conditions: towing (self-tripping and tow-tripping modes of capsizing), where water on deck is encountered, in following seas, and in wind. An analysis of the encounter of certain groups of waves is described. The proposed criteria are applied to 51 different towing and fishing vessels and the results are compared to existing practice. Recommendations are made for future research.

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REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
IMCO,		74	-	-	-	-	-	-	-	B	-
"	DEC,	76	-	-	-	-	-	-	-	B	-
"	NOV,	77	-	-	-	-	-	-	-	A	-
INOUE,	FEB,	73	-	-	-	-	-	C	-	-	B
IWATA,	DEC,	72	B	-	-	-	B	-		B	B

A = 1st Class Material, Important to Program

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IMCO 74 "International Conference on Safety of Life at Sea 1960, Supplement 2", Inter-governmental Maritime Consultative Organiz, 1974. Summary: This volume contains the texts of amendments to the International Convention for the Safety of Life at Sea, 1960, adopted by the Assembly of the Inter-Governmental Maritime Consultative Organization at its seventh and eighth regular sessions (October1971 and Novemeber 1973 respectively) in accordance with the provisions of Article IX (b) of the Convention.

IMCO DEC 76 "Code of Safety for Dynamically Supported Craft", IMCO Report to the Maritime Safety Committee No. DE XVI/12/Add.1, 20 Dec. 1976.

IMCO NOV 77 "Code of Safety for Dynamically Supported Craft", Resolution A-373 (x) adapted 14 Nov. 1977.

INOUE FEB 73 "The Effects of Wind on Ship Maneuverability", by S. Inoue, Y. Ishibashi, Society of Naval Architects of West-Japan, Trans, N45, Feb. 1973, pp. 115-129. Summary: In a previous report, the authors investigated the effects of wind on ship maneuverability in the range of the wind speed for the ship speed which is not very large. In this report, the effects of wind in the range of the wind speed for the ship speed where the ship is unmaneuverable were calculated by use of the forces and moments acting on a ship in wind and oblique flow. As a result, the speed, drift angle, drifting direction. the locus and the course stability of a ship drifting obliquely in uniform wind are shown.

IWATA DEC 72 "Ice Accumulation on Ships (Fourth Report)", by S. Iwata. Society of Naval Architects of Japan. Journal of, V. 132, Dec. 1972, pp. 185-202. in Japanese. Summary: In the third report. the author presented the results of his comparison between the growth rate and amount of ice accreted on patrol boats obtained from icing experiments conducted at sea and the rate and amount of ice estimated by the theories of forced convection of heat developed in the first and second reports. The author has made a comparison of amounts and centres of gravity of ice accreted on various types of patrol boats and two fishing vessels estimated by two theories and by the USSR icing of the comparison that the USSR icing norms are proposed by the author on the basis of the already reported investigations and studies.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
JONES, APR 73	-	-	-	-	-	-	-	C	-

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JONES APR 73	"Development of a High Speed Rescue Boat", E.L. Jones, P.B. Fontneau and W. Buote, presented at SNAME Spring Meeting, Lake Buena Vista, Fla., April 2-4, 1973. Paper A:73. Available SNAME.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
KASTNER,	NO DATE	-	-	-	-	-	A	-	A	-
KELLY,	JUL, 66	-	-	-	-	-	-	-	B	-
KENNEDY,	SEPT, 73	-	-	-	-	-	-	-	B	-
KINNEY		-	-	-	-	-	-	-	C	-
KOYAMA,	MAY, 72	-	-	-	-	-	-	-	B	-
KYUSHA U.,	69	-	-	-	-	-	B	-	-	-

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KASTNER	"Capsizing of Ships in a Longitudinal Irregular Seaway", by S. Kastner, Schiffstechnik, Schroedter and Company, no date, pp. 11-20. Summary: A method is introduced for the statistical determination of the rolling behavior of a ship in a longitudinal irregular seaway, at large rolling angles. The time varied irregularity in the variation of the righting moment is represented by a normalized spectrum. The discussion of certain characteristic capsizing events the statistical evaluation of the computed time periods until capsizing, is described.
KELLY July 66	"Safety of Life at Sea", by H.J. Kelly, presented to Hawaii Section of SNAME, July 1966. Available SNAME.
KENNEDY SEPT 73	"Static and Dynamic Stability of a Small Fourteen Foot Flat Bottom Boat as it Relates to Boating Safety", by Michael Kennedy, presented to New England Section of SNAME, Sept. 1973. Available SNAME.
KINNEY 73	"Skene's Elements of Yacht Design", by F.S. Kinney, Dodd, Mead & Company, New York, N.Y., 1973.
KOYAMA MAY 72	"A Proposal of a Method to Specify the Permissible Region of Instability in the Steering Characteristics of Ships", by T. Koyama, International Shipbuilding Progress, V. 19 N213, May 1972, pp. 152-156. Summary: The way to specify the permissible region of instability of ships is proposed form the viewpoint that ships should be controllable for any human operator without difficulty. In the case of the steering of the ship (course keeping), where the motions of ships are small, we can approach that problem with a linear equation. The importance of the time constant T, as well as the proportionality coefficient K, is stressed. Assuming a very simple human operator model, which can be followed by any human operator, the permissible region is specified as a combination of T and K.
KYUSHU U. 69	"On the Swaying, Yawing and Rolling Motions of Ships in Oblique Waves", by F. Tasai, Kyushu University, Jr. of Soc. of Naval Arch. of Japan, Selected Papers, V. 3, 1969, pp. 92-108. Summary: In this paper an approximate method is introduced to calculate the swaying force, yawing and rolling moments acting upon a ship navigating in oblique waves.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
LANG	NOV,	74	-	C	-	-	C	C	-	-	-
LARSON,	FEB,	66	-	-	-	-	C	-	-	-	-
LETCHER,	JUL,	76	-	-	-	-	-	-	-	C	-
LIPPMAN,		73	-	-	-	-	-	-	-	B	-
LLOYDS,			-	-	-	-	-	-	-	B	-

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LANG NOV 74	"Design and Development of the 190-Ton Stable Semisubmerged Platform (SSP)", by T.G. Lang, J.D. Hightower, A.T. Strickland. Journal of Engineering for industry, Nov. 1974.
LARSON FEB 66	"Faster Landing Craft", by N.O. Larson, U.S. Naval Institute Proceedings, 3450, February 1966.
LETCHER JULY 76	"Performance and Stability of Wind-Referenced Autopilots for Sailing Vessels", by J.S. Letcher Jr. Marine Technology, July 1976, p. 301.
LIPPMAN 73	"Small Craft Standards", by G.J. Lippmann, American Boat and Yacht Council, Inc., SNAME, Paper L. 1973. Summary: Discusses how it is necessary for everyone from the desinger to the user to become involved with the standards writing organizations.
LLOYDS	"Rules and Regulations for the Construction and Classification of Wood and Composite Yachts", by Lloyds, Lib. of Congress No. 426-5655.

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REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
MANDEL,	69	-	-	-	-	-	C	-	-	-
MANTLE,	SEPT, 76	-	C	-	-	C	C	-	C	-
"	76	-	B	-	-	C	C	-	C	-
"	NOV, 77	-	C	-	-	C	C	-	C	-
MARCHETTI,	FEB, 68	-	C	-	-	-	C	-	-	-
MARITECH,	DEC, 71	-	-	-	-	-	C	-	-	-
MARKATOS,	DEC, 78	-	-	-	-	-	-	-	-	C
MATHIS,	MAY, 74	-	-	-	C	-	-	-	-	-
MICHIGAN U.,	JAN, 70	-	-	-	-	-	-	-	B	-
"	FEB, 70	-	-	-	B	-	B	-	-	-
MICHIGAN U.,	FEB, 74	-	-	-	-	-	B	-	-	-
MIT,	AUG, 73	-	-	-	-	-	C	-	-	C
MOD (UK),	78	-	-	-	-	-	-	-	C	-
MOLZAHN,	SEPT, 67	-	-	-	-	-	-	-	B	-
MORRALL,	APR, 79	-	-	-	-	-	-	-	B	-
MRIS,	OCT, 76	General Bibliography				-	-	-	-	-
"	DEC, 78	General Bibliography				-	-	-	-	-
MCGOWN,	JAN, 61	-	B	-	-	-	-	-	B	-
MDAC,	AUG, 68	-	-	-	-	-	C	-	-	-
"	SEPT, 70	-	-	-	-	-	C	-	-	-

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MANDEL 69 — "Water, Air and Interface Vehicles", by Philip Mandel, First Edition, MIT Press, 1969.

MANTLE 20 SEPT 76 — "The Advanced Naval Vehicle Concept Evaluation", by Peter Mantle, T.L. Meeks, AIAA/SNAME Paper No. 76-846, Sept 20-22, 1976.

MANTLE 76 — "Cushions and Foils", by P.J. Mantle, SNAME Spring Meeting, 1976.

MANTLE NOV 77 — "Advanced Concepts for Sea Control", by Peter J. Mantle, SAE No. 770966, Nov. 14-17, 1977.

MARCHETTI FEB 68 — "Extraction of Aerodynamic Derivatives from Flight Data, Using an Analog Regression Technique", by R.M. Marchetti, Journal of Aircraft, V5, No. 1, ASDB 10-U02472M, Feb. 1968.

MARITECH DEC 71 — "Ship Rolling at Zero Speed in Random Beam Seas with Nonlinear Damping and Restoration", by L. Vassilopoulis, Maritech Inc., Journal of Ship Research, SNAME, V. 15, N4, Dec. 1971, pp. 289-294. Summary: A theoretical method is developed for estimating the root-mean-square of nonlinear roll for surface ships at zero speed under the influence of random beam seas.

MARKATOS DEC 78 — "Stochastic Modelling of Dynamic Properties of Nonlinear Water Waves", by N.C.G. Markatos, "Applied Mathematical Modelling", Fol. 2, No. 4, Dec. 1978, p. 227-238, IPC Business Press.

MATHIS MAY 74 — "Propeller Slipstream Performance of Four High-Speed Rudders under Cavitating Conditions", by P.B. Mathis and D.L. Gregory, NSRDC Report 4361, May 1974.

MICHIGAN U. JAN 70 — "Relationships Between the Profitability and Safety of Ships", by O. Krappinger, Michigan University, No. 068, Jan. 1970.

MICHIGAN U. FEB 70 — "Simplified Methods for Calculation of Damping Coefficients Using Records of Free Nonlinear Rolling with Large Amplitude Decay", by R.V. Borisov, Michigan University, N050, Feb. 1970. Summary: Large amplitude decay is the constant phenomenon of the free nonlinear rolling of the ships with bilge keels, in the case of deck submergence in model rolling tests, etc. Several different methods can be used to interpret the records of model rolling tests. Some of them are inadequately precise for the rolling with large amplitude decay, some are quite accurate but very complicated. The methods described enable one to make simple and accurate calculations of damping coefficients with large and small rolling amplitude decay.

MICHIGAN U. FEB 74 — "The Fundamental Assumptions in Ship-Motion Theory", by T.F. Ogilvie, Michigan University, No. 148, Feb. 1974, FT-Grant, CN-NSF GK-16848. Summary: Some of the fundamental assumptions of ship-motion theory are examined for the purposes of elucidating the success of the heuristically derived strip theory of Korvin-Kroukovsky and of recognizing some inadequacies of that theory.

MIT 24 AUG 73 — "Exciting Forces on a Moving Ship in Waves", by W.R. McCreight, Massachusetts Institute of Technology, PhD Thesis, 24 Aug. 1973. Summary: The exact equations for the diffraction of plane waves of arbitrary direction by a steadily moving slender ship and for the radiation of waves resulting from the forced oscillations of the same slender ship while moving astern on calm water are formulated.

MOD (UK) 78 — "Operational Requirements and Choice of Craft", by Captain D.M. Eckersley-Maslin, R.N. and J.F. Coates, Ministry of Defence(Navy), Symposium on Small Fast Warships and Security Vessels, 1978, RINA.

MOLZAHN SEPT 67 — "American Boat and Yacht Council Safety Standards", by H.J. Molzahn, presented to Southeast Section of SNAME, Sept. 1967.

MORRALL APR 79 — "Capsizing of Small Trawlers", by A. Morrall, RINA Paper No. 12, Spring Meeting, Arpil 1979, London.

MRIS OCT 76 — "Maritime Research Information Service - Cumulative Index 1970-1976", Transportation Research Board, National Research Council, National Academy of Sciences, Oct. 1976.

MRIS DEC 78 — "Cumalative Index Search", MRIS File Search, List of Abstracts, Run No. M000316, MRIS, National Research Council, National Academy of Sciences, Dec. 13, 1978.

MCGOWN JAN 61	"The Seaworthiness Problem in High Speed Small Craft", by S.C. McGown presented to Nwq York Metropolitan Section of SNAME, Jan. 1961.
MDAC AUG 68	"USAF Stability and Control Datcom", by D.E. Ellison, McDonnell Douglas Astronautics Co., ASDB 10-U06598M, (AD848286), Aug. 1968.
MDAC SEPT 70	"USAF Stability and Control Datcom-Instructions for Revision", by D.E. Ellison, ASDB 10-U06597M, (AD881725), McDonnell Douglas Astronautics Co., Sept 1970.

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NASA,		61	-	C	-	-	-	C	-	-	-
NAVSEA,	JUL,	75	B	B	B	B	B	B	B	C	B
NAVSEC,	AUG,	75	-	-	-	-	-	-	-	C	-
NAVSEC,	OCT,	75*	-	-	-	-	-	-	-	A	-
NAVSEC,	JUN,	76	-	-	-	-	-	-	-	C	-
NEWMAN,	JUL,	57	-	-	-	-	-	C	-	-	-
NICKUM,	JAN,	64	-	-	-	-	-	-	-	B	-
"	JUL,	78	-	-	-	-	-	-	-	A	-
NMI,	APR,	79	-	-	-	-	-	-	-	A	-
NMRC,	AUG,	74	-	C	-	-	-	-	-	-	-
NMRC,	DEC,	74	-	-	-	-	-	-	-	B	-
NORDSTROEM,	MAY,	75	-	-	-	-	-	-	-	C	-
NPL,	MAR,	70	-	-	-	-	-	-	-	-	A
"	APR,	74	-	-	-	-	-	-	-	B	B
NPS,	DEC,	73	-	-	-	-	-	B	-	B	-
NPS,	DEC,	74	-	-	-	-	-	B	-	B	-
NSMB,	JAN,	68	-	-	-	-	-	-	-	C	-
NTIS,	DEC,	78	-	-	-	-	-	-	-	B	-
NUF,	APR,	79	B	B	B	B	B	B	B	B	B
NUMATA,		57	-	-	-	C	-	-	-	C	-
NURDC,	MAY,	72	-	-	-	-	C	C	-	C	-

A = 1st Class Material, Important to Program

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B = Supporting Material

*CONTAINS ESSENTIALLY THE SAME MATERIAL AS GOLDBERG FEB 74.

NASA 64 — "Stability and Control Characteristics of a Model of an Aerial Vehicle Supported by Four Ducted Fans", by L.P. Parlett, National Aeronautics and Space Administration, NASA-TN-D-937 (AD 262 310), 1961.

NAVSEA JULY 75 — "Seakeeping in the Design Process", Research and Technology Directorate, Naval Sea Systems Command, U.S. Navy. Remarks: workshop held at U.S. Naval Academy, June 1975.

NAVSEC AUG 75 — "Design Data Sheet-Stability and Buoyancy of U. S. Naval Surface Ships", Naval Ship Engineering Center, ASDB 10-U08459M, Aug. 1975.

NAVSEC OCT 75 — "Current Status of Stability and Buoyancy Criteria Used by the U.S. Navy for Advanced Marine Vehicles", by L. Goldberg and R.G. Tucker, Naval Ship Engineering Center, Naval Engineers Journal, V. 87 n5, Octo. 1975, pp 33-46. Summary: Hullborne stability and buoyancy criteria (intact and damage) are presented for advanced marine vehicles such as hydrofoil craft, air cushion vehicles, surface effect ships, and low waterplane catamarans. Not covered is stability during flying or on-cushion modes. The criteria attempt to recognize special operations and hazards associated with the unusual characteristics of these types. Examples are: the danger of large rip damage when flying at high speeds, the potential of large unsymmetrical flooding, and the lightweight structure resulting in less resistance to damage. The criteria presented here are likely to change as more design and operational experiences are acquired.

NAVSEC JUNE 76 — "Ship Design Margins: Issues and Impacts" by W. A. Hockberger, Naval Engineers Journal, June 1976.

NEWMAN JULY 57 — "On the Damping of Pitch and Heave", by J.N. Newman, Journal of Ship Research, July 1957.

NICKUM JAN 64 — "Some Thoughts on Stability criteria", by G.C. Nickum presented to the Pacific Northwest Section of SNAME, Jan. 1964.

NICKUM JULY 78 — "An Evaluation of Intact Stability Criteria", by G.C. Nickum, Marine Technology, Vol. 15, No. 3, July 1978, pp 259-265. Remarks: Coast Guard and Navy intact stability criteria which were in existence in 1952 are described. The evolution of the IMCO criteria for fishing vessels and for all other vessels under 100m(328 ft) in length and of the Coast Guard criteria for offshore supply vessels and towing vessels is described. The conclusion is reached that these criteria properly applied are adequate to ensure stability for seagoing vessels.

NMI APR 79	"Capsizing of Small Trawlers", by A. Morrall, National Maritime Institute (United Kingdom), 29 April 1979. Remarks: Results are presented of an investigation into the behaviour in rough water and breaking waves of two inshore fishing vessels having almost identical principal dimensions and displacement, but with different statical stability characteristics. In breaking waves, hydrodynamic conditions exist which may endanger a small fishing vessel with an inadequate reserve of stability. It is concluded that the margin of stability for small inshore fishing vessels as required by the IMCO criteria appears to be insufficient to prevent capsizing in certain possible sea conditions.
NMRC AUG 74	"Satisfactory Service Experience with Fluidic Element Controlled Ship Roll Stabilization System", Shipping World and Shipbuilder, V.167 N3896, Aug. 1974, National Maritime Research Center. Summary: A motion control system for the automatic stabilization of ships whereby rolling can be reduced to a minimum even in heavy seas has been developed and is described.
NMRC DEC 74	"Design Standard Studies for Cutter Suction Dredges", by I. Ofuji, M. Katoh, National Maritime Research Center, N-969, World Dredging and Marine Construction, V10 N14, Dec. 1974, pp. 64-69. Summary: This article discusses the design of non-propelled cutter suction dredges, with special regard to the lack of safety measures incorporated in the dredge designs. The stability of these types of dredges, including static and dynamic stability and stability in wind and waves are discussed and described. This article is an excerpt of a technical paper entitled "Studies on Design Standards for the Safety of Cutter Suction Dredge".
NORDSTROEM MAY 75	"Safety Problems in Commercial Vehicle Handling", by L. Strandberg, O. Nordstroem, S. Nordmark, National Swedish Road and Traffic Research Inst., Available NTIS HC A04/MF A01, May 1975.
NPL MAR 70	"The Definition of Sea State for Hovercraft Purposes", Hovering Craft and Hydrofoil, Vol. 9, March 1970, pp 13-17. Remarks: The paper was prepared by the NPL Hovercraft Sea State Committee United Kingdom (Chairman, Dr. N. Hogben), on which the following organizations are represented in addition to the Hovercraft Unit and Ship Division of NPL: British Hovercraft Corporation, Cushioncraft Ltd, Hovermarine Ltd. Meteorological Office, National Institute of Oceanography and Vosper Thornycroft Ltd. The need to take wind and waves into account when specifying sea state for hovercraft purposes has caused considerable misunderstanding and ambiguity in the past. Recommendations are given in this paper and it is suggested that they be accepted as a basis for avoiding misunderstanding in the future.

NPL APR 74 — "Damage Stability Model Experiments", by H. Bird, R.P. Browne, National Physical Laboratory, England, Naval Architect, April 1974, pp. 69-91. Summary: The paper describes a series of experiments in waves with a flooded model of a typical passenger and vehicle ferry. The objective was to provide designers and approving authorities with data with which to assess ship safety in damaged conditions in a quantifiable manner relative to sea conditions. Safety in this context is not absolute, depending upon compliance with a regulation, but a continuous function related to environmental conditions. (Author)

NPS DEC 73 — "Dynamical Stability and Maneuverability of Dynamically Unstable Ships", by D.S. Park, Naval Postgraduate School, MS Thesis, Dec. 1973. Summary: The factors affecting the stability and the maneuverability of a dynamically unstable ship were studied using the linear and non-linear equations of the motion of the ship. (AD-772844/7)

NPS DEC 74 — "Maneuvering Characteristics of Automatically Controlled Ships with Directionally Unstable Hulls", by A.G. Hozos, Naval Postgraduate School, MS Thesis, Dec. 1974, (AD/A-003-788/7GA). Summary: The stabilization of a dynamically unstable ship and the maneuvering characteristics of the combination,unstable/stabilized ship were studied using the linear and non linear equations of motion of a ship.

NSMB JAN 68 — "Vertical Motions and Bending Moments in Regular Waves-A Comparison Between Calculation and Experiment", by W.P.A. Joosen, R. Wahab, J.J. Woortman, Netherlands Ship Model Basin, Publ. No. 306, International Shipbuilding Prog. Vol. 15, No. 161, Jan. 1968.

NTIS DEC 78 — "Stress Factors on Pilot Performance, A Bibliography with Abstracts", by National Tech. Information Service, U.S. Dept of Commerce NTIS /PS-78/1289, Dec. 1978. Remarks: Search period covers 1964 to Dec. 1978.

NUF APR 79 — "The Capsizing of M/S HELLAND-HANSEN -- The Investigation and Recommendations for Preventing Similar Accidents", by Emil Aall Dahle and Olav Kjaerland, The Royal Institution of Naval Architects, RINA Spring Meetings '79, Paper No. 11, April 29, 1979, Norwegian University of Fisheries. Remarks: In a capsizing investigation of M/S HELLAND-HANSEN (L_{OA}=34.7m), model experiments have been performed with the vessel in a ballast condition positioned broadside to breaking waves. The experiments show that the stability requirements set forth at the Torremolinos International Conference for the Safety of Fishing Vessels 1977 are inadequate for this situation. The GZ-curve should be positive up to heeling angles of at least 80° to prevent capsizing.(Author)

NUMATA 57 "An Experimental Study of the Effect of Extreme Variations in Proportions and Form on Ship Model Behavior in Waves", Stevens Institute of Technology", by E. Numata and E.V. Lewis, Davidson Lab. Report No. 643, 1957.

NURDC AMY 72 "Hydrodynamic Design of an S^3 Semi-Submerged Ship:, by T.G. Lang, Naval Undersea Research and Development Center , May 1972.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
PHILLIPS-BRIT	C	C	C	C	C	C	–	C	C

A = 1st Class Material, Important to Program

B = Supporting Material

C = Useful but Nonessential to Program

PHILLIPS
57

"Naval Architecture of Small Craft", by D. Phillips-Birt, The Philosophical Library, 15 East 40th Street, New York, N.Y. 10016, 1957.

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REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
RATCLIFF,	JAN,	75	-	C	-	-	-	-	-	-	-
RINA,	SEPT,	71	B	B	B	B	B	B	-	-	B
"	SEPT,	78	-	-	-	-	-	-	-	B	-
"		79	-	-	-	B	-	B	-	-	-
RONNSEVELLE,	MAY,	73	-	-	-	-	-	-	-	B	-

A = 1st Class Material, Important to Program

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B = Supporting Material

RATCLIFFE JAN 75	"Vane Self-Steerers for Cruising Yachts", by G. Ratcliffe presented at SNAME/CBYRA Sailing Yacht Symposium Jan. 1975. Available from SNAME.
RINA SEPT 71	"Symposium on Small Craft", The Royal Institution of Naval Architects, September 1971. Held in the Physics Lecture Theatre at the University of Southampton, Southampton, England, UK. Available DOT Library.
RINA SEPT 78	"IMCO Regulations for Ship Design" by P.S. Katsoulis, Maritime Technology Monograph No.5, Royal Institution of Naval Architects, Sept. 1978. Remarks: Contains a catalog of various IMCO regulations, recommendations and other documents which are important in ship design.
RINA 79	"Ship Roll Response and Capsize Behaviour in Beam Seas", by J.H.G. Wright & W.B. Marshfield, The Royal Institution of Naval Architects, Paper No. 10, Spring Meeting, 1979.
ROUNSEVELLE MAY 73	"Recreational Boating Safety Standards", by R. Rounsevelle presented to Los Angeles Metropolitan Section of SNAME, May 1973.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
SARGENT,	APR,	68	C	C	-	-	-	-	-	-	-
SAUTHULIS,			-	-	-	-	-	-	-	C	-
SCRAGG,	JUL,	77	-	C	-	C	-	C	-	-	-
SEASTROM,	APR,	74	-	-	-	-	-	C	-	-	-
SHAMA,	DEC,	75	-	-	-	-	-	-	-	B	-
SILVERLEAF,			C	C	-	-	-	-	-	-	-
SINCLAIR,	JUN,	74	C	C	-	-	-	-	-	C	-
SIT,	NOV,	67	-	-	-	C	-	C	-	C	-
"		73	-	-	-	-	-	B	-	B	-
"		75	-	-	-	B	-	B	-	B	-
SKOLNICK,	APR,	74	-	-	-	-	-	-	-	B	-
SNAME,	JUN,	74	-	B	-	B	-	B	-	-	B
"	DEC,	77	General Bibliography				-	-	-	-	-
STIRLING,		66	-	-	-	-	-	-	-	C	-
STORCH,	MAR,	72	-	-	-	-	-	-	-	B	B
STORCH,	JAN,	78	B	B	-	-	-	-	-	B	B

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B = Supporting Material

SARGENT APR 68	"United States Army Shallow-Draft Boat Program", by Sargent, AIAA/SNAME, April 1968.
SAUTHULIS MAY 75	"Level Flotation Standards Analysis Research and Development Report", by C. Sauthulis, J. Bowman, and T. Chadwick, Wyle Labs, Huntsville, Alabama, MSR-74-16, USCG-D-112-75, (AD-A014 645/6WO, May 1975.
SCRAGG JULY 77	"Determination of Stability Derivatives by Impulse-Response Techniques", by C.A. Scragg.Marine Technology, July 1977, p. 265.
SEASTROM APR 74	"Practical Application of Water Jet Propulsion in Pleasure and Commercial Boats", by J. Seastrom.Presented to Gulf Section of SNAME, April 1974.
SHAMA DEC 75	"The Risk of Losing Stability of Displacement Vessels", by M.A. Shama, Arab Maritime Research Journal, N3, Dec. 1975, pp 47-66. Summary: The deficiency of initial stability, as a general measure of ship stability, is indicated. The variability of the main parameters affecting initial and dynamical stability is discussed. Particular emphasis is placed on the calculation of the risk of losing ship stability. Because of the lack of adequate statistical data to establish the mathematical model respresenting the random variation of the relevant parameters associated with initial and dynamical stability, a truncated normal probability density funciton is assumed. Therefore, initial and dynamical stability also follow a truncated normal distribution by virtue of statistical independence. However, for the sake of simplicity, the calculation of the risk of capsizing, or losing GM; is based on a normal probability density function. No attempt is made to establish or examine stability standards and criteria. Problems regarding damage stability, stability of ships among waves, the carriage of bulk cargo and the effects of forward motion are outside the scope of this paper.
SILVERLEAF MAR 69	"A Comparison of Some Features of High Speed Marine Craft", by A. Silverleaf and F.G. R. Cook, paper read at the Royal Institute of Naval Architects, London, England, March 1969.
SINCLAIR JUNE 74	"Developments in Small Craft Design", by T.L. Sinclair,Jr. Presented to Hawaii Section of SNAME June 1974.
SIT NOV 67	"Method for Predicting Rate of Shipping Water", by G.M. Worden, ASDB 10-U05324LF, Stevens Institute of Technology, (AD83852), November 1967.

SIT AUG 73	"Ship Maneuvering Performance with Various Degrees of Dynamic Course Stability", by H. Eda, Stevens Institute of Technology, Final Rpt, SIT-DL-73-1655, Aug. 1973. Remarks: Results are given of analytical studies to evaluate the effect of inherent dynamic course stability on ship performance in an effort to indicate guidelines to acceptable degrees of instability. (AD-775338/7)
SIT MAY 75	"Experimental Study of Stability Limits for Semi-Submersible Drilling Platforms", by E. Numata and A.C. McClure, Stevens Institute of Technology, Offshore Technology Conference, 7th Annual, Proceedings, V2, Houston, Texas, May 5-8, 1975, OTC 2285, pp 383-389. Summary: The existing stability criterion for semi-submersible drilling platforms requires thirty percent margin of righting moment eaergy over wind heel energy to allow for dynamic effects. This second report of a series uses model test results to predict the statistical probability of a downflooding type of casualty for various sea conditions. A six-column twin hull semi-submersible and a four-column footing type vessel are examined in an attempt to test the adequacy of the existing stability criterion.
SKOLNICK APR 74	"Crew Performance Requirements in the Vibration Environments of Surface Effect Ships", by A. Skolnick, ASDB 10-U09153, April 1974. Remarks: This paper was presented at the aerospace medical panel at the Norwegian Eng. Society. The material presented in this paper is a compilation of material previously presented.
SNAME JUNE 74	"Seakeeping 1953-1973", SNAME, Tech and Res. Symposium S-3, June 1974. Summary: This symposium report contains the papers and a summary of the discussions given at a Seakeeping Symposium held to commemorate the 20th anniversary of the milestone paper, "On the motions of Ships in Confused Seas" by Manley St. Dennis and Dr. Willard J. Pierson, Jr. Also included are papers by Drs. St. Dennis and Pierson giving their feelings on the future direction of work in this area. The symposium was divided into sessions covering: Waves; Transfer Function and Hydrodynamics Inputs; and Ship Response Theory and Application. The report contains a total of thirteen papers on the subject of seakeeping. Sponsored by SNAME Panel H-7 (Seakeeping Characteristics) at Webb Institute of Naval Architecture.
SNAME DEC 77	"Index of SNAME Publications 1961-1977", SNAME, New York, N.Y.
STEVENS FEB 74	"Technological and Operational Constraints in Advance Marine Vehicle Design", by R. Stevens, B. Carson, R.H. Krida, AIAA/SNAME Advanced Marine Vehicles Conference, San Diego, California, Feb. 1974.

STIRLING 66 — "Progress and Marine Safety", by A.G. Stirling. Spring Meeting of SNAME 1966.

STORCH 11 MAR 72 — "Stability of Offshore Towboats", by R.L. Storch, Presented at the meeting of the Pacific Northwest Section of SNAME, 11 March 1972. Summary: A review of available stability criteria, tugboat casualty data and existing U.S. tugboat designs is made to recommend stability criteria for use in the design of offshore tugboats. Casualty data for all tugboat/tugboat operations are presented, with breakdowns of offshore casualties and intact stability casualties. A discussion of the mechanisms of intact stability casualties is included. Fourteen existing tugboat designs are listed and compared according to design and stability characteristics. Specific recommendations are then made concerning design features to limit the occurrence of stability casualties and stability criteria to be used for future designs.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE		FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
TRANSPORT CANADA	OCT, 71	-	-	-	-	-	-	-	A	-
TREFFS,	SEPT, 67	-	-	-	-	-	-	-	C	-

A = 1st Class Material, Important to Program

B = Supporting Material

C = Useful but Nonessential to Program

TRANSPORT, CANADA OCT 71	"Proposed Interim Guidelines for Subdivision and Stability of Air-Cushion Vehicles in the Displacement Mode", Dept. of Transport, Canada, ASDB 10-U07701M, Oct. 1971. Remarks: Approved by M.S.C. for ACV's and Hydrofoils.
TREFFS SEPT 67	"The Application of U.S. Laws and Regulations to Pleasure and Small Commercial Vessels", by G.T. Treffs. Presented to Southeast Section of SNAME, Sept. 1967.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE			FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
UC, L	MAR,	73	-	-	-	-	-	-	-	B	B
"	NOV,	73	-	-	-	-	-	B	-	-	-
"	MAR,	75	-	-	-	-	-	B	-	B	B
"	APR,	79	B	B	-	-	B	B	-	C	B
UL1,	OCT,	73	-	-	-	-	-	-	B	B	B
USCG,	JULY,	65	-	-	-	-	-	-	-	C	-
"		70	-	-	-	-	-	-	-	B	-
"	JULY,	72	-	-	-	-	-	-	-	B	-
"	AUG,	72	B	B	-	-	-	-	-	B	-
"	OCT,	73	-	B	-	-	-	B	-	C	B
USCG,	NOV,	73	-	-	-	-	-	B	-	B	-
"	FEB,	75	-	-	-	-	-	-	-	B	-
"	FEB,	75	B	B	-	-	-	-	-	-	-
"	JULY,	76	-	-	-	-	B	-	-	-	-
USCG,	APR,	77	-	-	-	-	-	-	-	B	-
"	JULY,	77	-	-	-	-	-	-	-	B	-
USHER	SEPT,	72	C	C	-	-	-	-	-	-	-
U.VIRGINIA,	APR,	77	-	-	-	-	-	-	-	C	-

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B = Supporting Material

UC, L.
MAR 73

"The Rayleigh Address to the British Acoustical Society: Ship Survival in Heavy Seas", by R.E. D. Bishop, University College, London, Journal of Sound and Vibration, V. 27 N2, March 1973, pp. 157-164.

UC, L.
NOV 73

"Directional Stability of a Ship Allowing for Time History Effects of the Flow", by R.E.D. Bishop, R.K. Burcher, W.G. Price, University College, London, Royal Society of London, V335 N1602, Proceeding, Nov. 1973, pp 341-354. Summary: It is shown how time-history effects are incorporated into the hydrodynamic representation to determine the directional stability and control of a ship.

UC, L.
MAR 75

"A Stability Analysis of the Roll Motion of a Ship in an Irregular Seaway", by W.G. Price, University College, London, International Shipbuilding Progress, V22 N247, pp 103-112. Summary: The restoring moment coefficient in the differential equation describing the roll motion of a ship is assumed time dependent - being either sinusoidal or random in form. The concepts of stability from a probabilistic viewpoint are defined and a method summarized how the stability of motion in this situation may be investigated.

UC, L.
29 APR 79

"The Influence of Hull Shape on Transverse Stability:, by R.K. Burcher, RINA Spring Meetings '79. April 29, 1979 Remarks: Changes in transverse stability can occur between the 'as designed' condition and the ship 'as built' and in motion in a seaway. This paper investigates the hull shape which would be required to retain a constant GZ curve in these changed conditions. For constant initial stability it is found that the sections at the waterline should slope normal to a line through the metacentre. Using a pressure vector approach, a better understanding of how section shape contributes to stability is developed. This approach is extended to non-hydrostatic pressure distributions. It is shown that there are small metacentric height changes at the crest and trough of a wave which are in opposite directions for Vee and Wall sided sections. (Author)

ULI
10 OCT 73

"Boating Accident Investigations 1972. Part II. Capsizing and Swamping", by H. Albing, R. Loeser, Underwriters Laboratories, Inc., Final Rpt., 10 Oct. 1973, CN-DOT-CG-23,200-A, (AD-773 778). Remarks: The report describes an investigation of capsizing and swamping accidents of pleasure boats under 20 feet in length during the 1972 season. The study, which was confined to accidents occurring within the continental United States, was aimed at: (1) identifying general boat design problems involved in such accidents, (2) determining if the problems exist despite compliance with existing Standards or because of a lack of compliance, (3) determining possible areas not adequately covered by present Standards, and (4) helping to develop investigation and analysis methodologies for continuation of the program. For each accident, estimates are made and tabulated of the contributions of various causative factors.

USCG
JULY 65

"U.S.C.G. Load Line Regulations", U.S. Coast Guard Report CG 1976, July 1965.

USCG
70

"Development of Maritime Safety Standards for Vessel and Equipment Construction by the U.S. Coast Guard", by R.J. Bosnak, U.S. Coast Guard, SNAME Spring Meeting, 1970. Remarks: A historical introduction develops the direct relationship between disasters, public opinion, and congressional action. The role of government, the evolvement and the use of voluntary consensus standards and certification programs, and the Coast Guards method of participation in such programs are discussed. The role of the classification society is considered. The international scene is treated with comments on both the governmental treaty organizations and the voluntary standards organizations. IMCO is described in some detail, including its organization and an assessment of its performance after some eleven years of life. A possible analytical method for translating potential failure into regulations is introduced and finally some possible future goals are set forth.

USCG
JULY 72

"IMCO and the Marine Industry", by L.W. Goddu, Jr., United States Coast Guard, published in Marine Technology Quarterly, Vol.9, No. 3, July 1972. Remarks: This paper discusses the creation and composition of the Intergovernmental Maritime Consultative Organization and describes the wide range of problems being considered by that organization such as pollution, fire prevention and containerization. The paper explains how the U.S. participates in this specialized agency of the United Nations and how the marine industry is and can be involved in the national and international deliberations.

USCG
AUG 72

"Test and Evalution of Small, Lightweight Boats", by J.M. O'Connell, United States Coast Guard, FTDC-532, August 1972. Remarks: The report discusses attempts to determine to what extent boats and other lightweight hulls will meet the compliance requirements of the proposed "Federal safe loading standard" and to investigate other safety problems inherent in such small boats. A series of test procedures are developed. The results indicate that the "gross weight capacity" as defined in the proposed Federal standard is the controlling factor in assigning capacity to boats such as those tested. The data also show that the existing boating industry Association "live load capacity test" is a practical way to determine capacity in the offset loading case. The results also indicate that boats of the type tested are generally overpowered. Small lightweight boats are shown to react quickly and violently to load shifts, and also present problems to ahead visibility. Recommendations for future test methods and testing emphasis are made. (Author modified abstract)AD-759475

USCG OCT 73 — "Development of a Time Domain Simulation for Ship Capsizing in Following Waves", by D.M. Bovet, United States Coast Guard, CG-733415, Final Rpt, USCG-D-28-74, Oct. 1973, (AD-770330/9). Remarks: The report describes the development of a time domain computer simulation for ship capsizing in the following waves. A survey of the recent literature in this field is presented. The formulation of the present approach is discussed, along with computer program limitations and assumptions. The program developed is used to study the phenomenon of low cycle roll resonance as demonstrated by a two-dimensional section in forced heave motion and by a fast cargo liner in following waves, both regular and irregular. (Modified author abstract)

USCG NOV 73 — "Recent Coast Guard Research Into Vessel Stability", by D.M. Bovet, United States Coast Guard, and R.E. Johnson, and E.L. Jones, Paper presented at the Chesapeake Seciton of SNAME, Nov. 28, 1973. Summary: The purpose of this paper is to give an overall view of what the U.S. Coast Guard is doing in the area of intact stability criteria for merchant vessels. The paper shows the development of present criteria, some of the problems with these criteria, and the research work that is being sponsored by the Coast Guard in this field. The last section of the paper discusses briefly a computer simulation developed by Bovet.

USCG FEB 75 — "Evaluation of Current Towing Vessel Stability Criterion and Proposed Fishing Vessel Stability Criteria, Volume One", by E.R. Miller, G.C. Nickum, J. Rudnicki, B.J. Young, DOT Report No. CG-D-69-75, Feb. 1975.

USCG FEB 75 — "Technical and Operational Characteristics of High Performance Watercraft", by F.M. Hamilton, C.W. Pritchett, H.H. Hudgins, United States Coast Guard, SUCG-D-193-75, #CGR-/DC-6/75, Feb.1975, (AD-A018 948/OGA). Remarks: This report catalogues high performance watercraft and their capabilities for Coast Guard personnel. It provides general operational and technical information regarding hydrofoils, hovercraft, mono-hull and multi-hull high performance vehicles and is divided into three sections for ease of reference. The first section deals with the technical and operational characteristics of the generic craft themselves while the second section compares craft capabilities. The third section abstracts available HPWC literature.

USCG JULY 76 — "High Performance Watercraft Assessment Model-Phase I Vol.V-Craft Parameters", by A. Passera, D. Prerau, C. Pritchett, Final Draft, U.S. Coast Guard, ASDB 10-U08569, July 1976.

USCG 1 APR 77	"Rules and Regulations for Uninspected Vessels", by U.S. Coast Guard, DOT, CG-258, April 1, 1977.
USCG 1 JULY 77	"Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons)", by U.S. Coast Guard, DOT, CG-323, 1 July 1977.
USHER SEPT 72	"A Comparison Between Hovercraft and Fast Patrol Boats", based on a talk given to the United Kingdom Hovercraft Society on Sept. 27, 1972, by P.J. Usher, of Vosper Thornycroft Ltd.
U. VIRGINIA APR 77	"Validation of the Passenger Ride Quality Apparatus (PRQA) for Simulation of Aircraft Motions for Ride Quality Research", by W. B. Bigler II, University of Virginia Report No. UVA/528060/ ESS77/ 108 April 1977.

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REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
VAN GUNSTERN,	-	-	-	-	-	C	-	-	-
VPI, JAN, 74	-	-	-	-	-	C	-	-	-
" OCT, 74	-	-	-	-	-	C	-	-	-

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B = Supporting Material

VAN GUNSTEREN	"Analysis of Roll Stabilizer Performance", by F.F. Van Gunsteren, Sea Transport Engineering N.V., Surinamekade 5, Amsterdam, The Netherlands.
VPI JAN 74	"Subharmonic and Superharmonic Resonances in the Pitch and Roll Modes of Ship Motions", by D.I. Mook, L.R. Marshall, A.H. Nayfeh, Virginia Polytechnic Institute and State University, Journal of Hydronautics, V8, N1, Jan. 1974, pp. 23-40. Remarks: The motion of a ship with two degrees of freedom-pitch and roll-when second-order, static couplings are included in the equations of motion, is considered. Nonlinear analysis of the response of the ship to a harmonic excitation (e.g., a regular sea) using the method of multiple scales is given.
VPI OCT 74	"Perturbation-Energy Approach for the Development of the Nonlinear Equations of Ship Motion", by A.H. Nayfeh, D.T. Mook, L.R. Marshall, Virginia Polytechnic Institute, Journal of Hydronautics, V8 N4, Oct. 1974. Remarks: A perturbation analysis of the nonlinear coupling between the pitch and roll modes is used to illustrate that an energy approach can be used to advantage in developing the nonlinear equations governing the motion of ships.

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
WALKER, MAR, 64	-	-	-	-	-	-	-	C	-
WOISIN, DEC, 71	-	-	-	-	-	-	-	C	-
WYLE LABS, APR, 75	-	-	-	-	-	-	B	-	-

A = 1st Class Material, Important to Program

C = Useful but Nonessential to Program

B = Supporting Material

WALKER MAR 64 — "Provisional Limits for Human Tolerance", by P.R. Payne, Walker (Norman K.) Associates, Inc., RPT-15, ASDB 10-U09464, March 1964. Remarks: Definition of limits for human tolerance to motions of an ACV.

WOISIN DEC 71 — "Principle of Superposition for the Statistical Stability of Ships", (Ein Ueberlagerungsprinzip in Der Statischen Schiffsstabilitaet", by G. Woisin and G.H. Schiffahrt, International Shipbuilding Progress, V18 N208, Dec. 1971, pp 453-462.

WYLE APR 75 — "Capsizing/Swamping Accident Investigations for 1974 Season. Volume II. Appendices B-U", Wyle Laboratories, Final Report, USCG-D-140-75, Apr. 1975, CN-DOT-CG-40672-A. Remarks: From several hundred boating accidents, twenty (20) were selected for in-depth investigation. Particular emphasis were placed on acquiring adequate data on the physical characteristics of the involved boats for use in the computer program LODCAP which calculates load capacities. The report summarizes the acquisition of the accident data, criteria for selection of those to be investigated, the investigation procedures, and the results of the twenty (20) in-depth investigations. (AD-A018 568/6GA)

REFERENCE EVALUATION AND SUBJECT INDEX

REFERENCE	FULL SCALE OPERATIONS, STATIC	FULL SCALE OPERATIONS, DYNAMIC	MODEL TESTS, STATIC	MODEL TESTS, DYNAMIC	ANALYTICAL STUDIES, STATIC	ANALYTICAL STUDIES, DYNAMIC	ACCIDENT REPORTS	CRITERIA	ENVIRONMENT
YAMANOUCHI, 71	-	-	-	-	-	C	-	-	-

A = 1st Class Material, Important to Program

B = Supporting Material

C = Useful but Nonessential to Program

Yamanouchi 71

"On the Application of the Multiple Input Analysis to the Study of Ship's Behaviour and an Approach to the Non-Linearity of Responses", by Y. Yamanouchi, Ship Research Institute, Tokyo, Selected Papers, Journal of Soc. of Naval Arch. of Japan, V7, pp 92-11, 1971.

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